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ERRATA.

Page	37	line	20	for	" *G. morsitans* "	read	" *G. morsitans submorsitans* "
,,	54	,,	1	,,	" Couby "	,,	" Couvy "
,,	71	,,	27	,,	" *univitattus* "	,,	" *univittatus* "
,,	85	,,	2	,,	" *Mystomys* "	,,	" *Myotomys* "
,,	95	,,	14	,,	" *Health*, vi "	,,	" *Health*, v "
,,	101	,,	37	,,	" HOFFMANN (W.A.) "	,,	" HOFFMAN (W. A.) "
,,	106	,,	30	,,	" *Panelax* "	,,	" *Panchax* "
,,	123	,,	42	,,	" E. H. Curran "	,,	" C. H. Curran "
,,	150	,,	46	,,	" *Spermophilus citellus* "	,,	" *Citellus* "
,,	152	,,	21	,,	" *A. hyrcanus*, Grassi "	,,	" *A. hyrcanus*, Pall."
,,	175	,,	3	,,	" nesting "	,,	" nestling "
,,	209	lines	7 & 18	for	" *Prosthogoninus* "	read	" *Prosthogonimus* "

IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW
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SERIES B.

VOL. XV.] [1927.

[LIPINA (N. N.).] **Липина (Н. Н.). Chironomid Larvae from the Basin of the River Oka.** [*In Russian.*]—*Arb. biol. Oka-sta.*, iv, pp. 72–122, 3 pls., 38 refs. Murom, 1926.

The Ceratopogonines dealt with include the genera *Bezzia, Culicoides* and *Palpomyia*, the species not being identified.

FRANCHINI (G.). **Brevi note di entomologia sulla Somalia e sulla Eritrea.** [Brief entomological Notes on Italian Somaliland and Eritrea.]—*Pathologica*, xvii, no. 404, pp. 494–495. Genoa, 15th September 1925.

The following Diptera are recorded from Somaliland: *Phlebotomus papatasii* and *P. minutus*; *Anopheles gambiae* (*costalis*), *A. maculipennis* (*claviger*) and *A. funestus* (in order of abundance); *Culex pipiens*, *Taeniorhynchus* sp., *Theobaldia longiareolata*, *T. annulata*, and *Aëdes argenteus*, which is exceedingly common both in the houses of Europeans and in native huts; and one specimen of *Glossina pallidipes*. The ticks included *Hyalomma aegyptium*, *Amblyomma*, *Haemaphysalis*, *Argas persicus* (spirochaetosis in fowls being widespread), *Ornithodorus moubata* and *O. savignyi*.

From Eritrea, *Aëdes argenteus*, *Theobaldia longiareolata*, *Culex pipiens*, and some Chironomids are recorded.

VENERONI (C.). **Le "Myiasi" nella Somalia Italiana.** [Myiasis in Italian Somaliland.]—*La Riforma medica*, xlii, no. 18, pp. 416–417, 1 fig. Naples, 3rd May 1926.

Myiasis is not rare in Italian Somaliland, and some cases are due to *Cordylobia* and other flies, but most of those observed by the author were caused by *Lucilia argyricephala*, Macq., the adult of which is not uncommon in the rainy season in places where herds are at pasture. The larvae may be found in man, dogs, goats, sheep and cattle.

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CORRIGAN (S. H.) & CORRIGAN (C. E.). **Three Cases of Creeping Myiasis in Saskatchewan.**—*Canad. Med. Assoc. Jl.*, xv, no. 4, pp. 403–404, 1 fig. Toronto, April 1925.

Three cases of myiasis are recorded in men working with horses in August, a month when bot-flies are active. A maggot found in one of these cases was identified as *Oestrus* (*Gastrophilus*) *intestinalis*, probably in the first or second stage.

BISHOPP (F. C.), MITCHELL (J. D.) & PARMAN (D. C.). **Screw-worms and other Maggots affecting Animals.**—*U.S. Dept. Agric.*, Farmers' Bull. 857, revd., 14 pp., 8 figs. Washington, D.C., 1924. [Recd. November 1926.]

This is a revised edition of a bulletin already noticed [*R.A.E.*, B, x, 162], with the addition of notes on recent investigations.

JENSEN (C. O.). **Dødsfald i Tlslutning til Behandling for Oksebremselarver.** [Fatal Cases in the Treatment of Ox Warble Maggots.]—*Maanedsskrift f. Dyrlaeger*, xxxvi, pp. 371–376. Copenhagen, 1924.

Since the legislation passed in 1923 [*R.A.E.*, B, xi, 110] requiring all warble maggots [*Hypoderma*] to be destroyed in Danish cattle, eight fatal cases have occurred. The symptoms of the so-called "rose fever" caused by these larvae are described. In some cases the maggots had been squeezed out from the warbles by hand, and in others hypol had been smeared into the warbles [*cf. R.A.E.*, B, viii, 82, 83].

KAPPEL (A.). **Acariasis hos et Faar.** [Mange in a Sheep.]—*Maanedsskrift f. Dyrlaeger*, xxxvi, pp. 501–502. Copenhagen, 1925.

A liniment of sulphur, creoline and oil (parts 1 : 1 : 5) had no effect on an infestation by *Demodex* in a sheep, but repeated applications of a mixture of equal parts of sapoformol and water cured it.

WINTER (T.). **Kalkben.** [Scaly Leg.]—*Maanedsskrift f. Dyrlaeger*, xxxv, p. 47. Copenhagen, 1923.

A method of curing fowls infested with *Cnemidocoptes mutans*, Rob., is described. A pit was dug outside the fowl house, smeared with clay and then filled with water containing creolin. The fowls were made to walk through the water several times a day, so that the creolin in the clay was carried on their legs into the house and smeared on their roosts. They recovered in a very short time, and the mites were all destroyed.

PETERSEN (A.). **Bidrag til de danske Simuliers Naturhistorie.** [Contribution to the Natural History of the Danish Simuliids.]—*Maanedsskrift f. Drylaeger*, xxxvii, pp. 1–19, 33–57. Copenhagen, 1925.

This is a reprint of part of a paper that has already been noticed [*R.A.E.*, B, xii, 170] and deals with the biology of the Simuliids that are of veterinary interest.

WADA (Hiratake). **The Poison in the Urticating Hairs of** *Dendrolimus spectabilis*. [*In Japanese.*]—*Jap. Jl. Dermatol. & Urol.*, xxvi, no. 3, pp. 230–244, 24 refs. (With a Summary in German, pp. 6–7.)

In a further investigation of the urticating hairs of *Dendrolimus spectabilis* [*R.A.E.*, B, xiv, 170], the nature of the poison involved was studied. A watery solution of the alcoholic extract has the same urticating action as the hairs. The poison has no haemolytic effect and does not contain either cantharidin or formic acid.

NOGUCHI (Hideyo). **Cultivation of** *Rickettsia*-**like Microorganisms from the Rocky Mountain Spotted Fever Tick,** *Dermacentor andersoni*.—*Jl. Exptl. Med.*, xliii, no. 4, pp. 515–532, 4 pls. Baltimore, Md., 1st April 1926.

In this study of the microorganisms of the spotted fever tick, *Dermacentor venustus* (*andersoni*), the presence was shown of organisms morphologically and tinctorially resembling the mature micro-organism of spotted fever, *Dermacentroxenus rickettsi*, and extremely difficult to differentiate from it. The commonest was *Bacillus rickettsiformis*, sp. n., *B. pseudoxerosis*, sp. n., and *B. equidistans*, sp. n., being rarer. All three are non-pathogenic to guineapigs, rabbits and monkeys (*Macacus rhesus*).

SPENCER (R. R.). **A Case of Typhus-like Fever following Tick Bite.**—*Pub. Health Repts.*, xli, no. 45, pp. 2523–2524. Washington, D.C., 5th November 1926.

A case is described in Virginia in which a patient developed fever ten days after being bitten by a tick that was afterwards identified as *Amblyomma americanum*, L., a species that has never been connected with the transmission of disease. The clinical aspects of the case suggested typhus fever, but the serum failed to agglutinate *Bacillus proteus* X_{19}. Rocky Mountain spotted fever was considered, but the locality and the fact that animal inoculations gave negative results made such a diagnosis very doubtful. The tick bites may have been a coincidence, but since they caused local sores and glandular enlargement preceding the attack of fever, their possible significance cannot be ignored.

BARBER (M. A.), KOMP (W. H. W.) & HAYNE (T. B.). **Malaria in the Prairie Rice Regions of Louisiana and Arkansas.**—*Pub. Health Repts.*, xli, no. 45, pp. 2527–2549, 24 refs. Washington, D.C., 5th November 1926.

The methods of rice cultivation in the former prairie regions of Louisiana, Texas and Arkansas are particularly favourable to the breeding of Anophelines, which occur in large numbers. *Anopheles quadrimaculatus*, Say, is the prevailing species in Arkansas, though *Anopheles crucians*, Wied., may occur. In Louisiana the proportion of *A. crucians* is high, the other species being *A. punctipennis*, Say,

and *A. quadrimaculatus*, while *A. walkeri*, Theo., has been found. The difference in the proportion of *A. crucians* is striking, since the breeding conditions in the two regions are similar except that the Arkansas fields are largely irrigated by water drawn from wells. Tests made to determine the hydrogen-ion concentrations of the water in the two areas showed the ranges (pH 6·0–8·6 in Louisiana and pH 6·8–9·2 in Arkansas) to be so similar as to make it unlikely that this is a factor in determining the prevalence of any particular species.

Culicine larvae are plentiful in the rice-fields, and the adults often constitute a pest. The common species include : *Psorophora columbiae*, D. & K., *P. discolor*, Coq., *P. ciliata*, F., and later, when the grass and algae increase, *Culex* (*Neoculex*) *apicalis*, Adams (*testaceus*, Dyar), and *Culex* (*Choeroporpa*) *leprincei*, D. & K.

The relation of rice culture to malaria in other localities is discussed and seems to show that the malaria rate is reduced only in those places where rice-growing has been accompanied by improved social and hygienic conditions of the people. Alessandrini has suggested that mosquito larvae bred under the favourable conditions found in rice-fields may themselves become less susceptible to malaria infection [*R.A.E.*, B, xiv, 15], but experiments by the authors proved that mosquitos from the Arkansas rice region could be infected with malignant tertian malaria. This, in addition to the fact that breeding conditions in rice-fields are sometimes very similar to those in swamps, and that malaria was formerly prevalent in certain rice-growing areas, makes it appear doubtful whether any species can be sufficiently modified by breeding in such a locality to decrease greatly its power of transmitting the disease.

The draining of rice-fields in September, and consequent diminution in the number of Anophelines in October, does not appear to influence the malaria rate. The suggestion that the proximity of thick woods may increase the prevalence of malaria is disproved by the fact that in the two areas under discussion, though the malaria rate is low, woods are plentiful, while malaria may be very intense in thinly wooded country such as Calabria in Italy. Other factors that might conceivably influence the prevalence of malaria are discussed [*R.A.E.*, B, xii, 55–56, 96 ; xiv, 85].

The comparative freedom from malaria may perhaps be ascribed to the relatively superior conditions of living of the rural population in the rice-growing regions compared with those found in other rural districts of the Southern States, rather than to mosquito factors.

The work of other authors on the control of mosquitos in rice-fields is briefly reviewed [*R.A.E.*, B, viii, 63 ; xiv, 125, etc.]. Paris green is effective as a larvicide in rice-fields when the rice plants are not so tall and thick as to intercept too much of the dust. A dust containing $\frac{1}{4}$ lb. Paris green, thrown into the air and distributed by the wind, killed 90 per cent. of the larvae over an area of approximately half an acre. Paris green, in the quantity necessary to kill the larvae, does not injure the rice plants, and might be a practical means of control in small groups of rice-fields, but in regions where many thousands of acres have to be treated the use of any known larvicide would be impracticable on account of the cost. Although the control exercised by fish in such large areas is very limited, it would be worth while to introduce them where they are lacking, as they reduce the number of all mosquitos to a certain extent. Legislation prohibiting the cultivation of rice within a certain distance of towns would not be practicable

in the prairie regions of the United States, where the towns and villages are often so close together that large areas of land, fit for little but rice-growing, would have to be abandoned.

CARPENTER (G. D. H.). **A Statistical Enquiry into the Records of Fishing Permits issued on Lake Victoria since the middle of 1922.**— *Uganda Prot. Ann. Med. & Sanit. Rept., 1925*, pp. 92–95. Entebbe, 1926.

Statistics showing the percentage of enlarged glands of fishermen on Lake Victoria inspected in each half-year since 1922 indicate that infection with sleeping sickness has not occurred even in the case of fishermen in contact with *Glossina palpalis* for the whole period. In the north-west corner of the Lake, the nature of the swampy, papyrus-lined shore prevents likelihood of contact with *G. palpalis*, yet in this district there is a definite slight increase in the percentage of enlarged glands; irritation from mosquito bites may be the cause.

SYMES (C. B.). **Report of the Section of Medical Entomology.**— *Kenya: Ann. Rept. Med. Res. Lab., 1925*, pp. 24–29. Nairobi [1926].

Work in South Kavirondo has proved that suitable areas infested with *Glossina palpalis* may be rendered fly-free and habitable by clearing and stumping operations, and that fords, watering-places and traffic routes can be rendered safe in this way. This is, however, only the first step in reclamation, and every effort must be used to prevent the return to bush of the treated areas. The native population is growing far more intelligent and helpful in this respect. It is essential that such clearing should be carried out by officers of the Administrative Department acting upon the advice of the technical officers of the medical and other departments.

G. palpalis (eastern form) and *G. brevipalpis* are the only species met with as yet in the Lake area; the latter in small numbers only along the Homa shore. Pupae of *G. palpalis* were found in the river belt and in sheltered spots on the shore, breeding being observed over wide areas. During clearing, the flies, both male and female, scatter and may be found in situations that are usually avoided, the colonies becoming thoroughly disorganised. The only natural enemy of *G. palpalis* yet noticed is the Chalcid, *Syntomosphyrum glossinae*, but the degree of parasitism is at present very low.

In a preliminary survey of the mosquitos of the Nairobi-Fort Hall Road area, the following were recorded in order of prevalence of breeding-grounds but not of adult numbers: *Anopheles maculipalpis, A. funestus, A. christyi, A. rufipes, A. gambiae* (*costalis*), *A. mauritianus, A. pretoriensis, A. squamosus* aud *A. rhodesiensis. Ornithodorus moubata* has been observed in considerable numbers in military camps used by recruits coming from Kavirondo and the Tanganyika Border; little attention has as yet been given to this subject. A collection of fleas from rats in one township included *Xenopsylla cheopis* (75 per cent. of the total), *X. brasiliensis, Echidnophaga gallinacea, Dinopsyllus lypusus, Ctenocephalus felis* and *C. canis.*

Three cases of intestinal myiasis in man are recorded; the larvae concerned have been provisionally identified as belonging to the genus *Sarcophaga.*

VAN SACEGHEM [R.]. **Propagation de *Theileria parva* par les tiques.**—*Bull. agric. Congo belge*, xvi, no. 3–4, pp. 582–591. Brussels, September-December 1925. [Recd. November 1926.]

It has been proved that high temperature increases the virulence of *Theileria parva*, and the low temperatures on the high plateaux of Ruanda-Urundi weaken and even suppress it, so that at altitudes above 8,000 ft. African coast fever does not occur. Ticks (*Rhipicephalus*) do occur in small numbers above this altitude. Previous writers on the subject have held that African coast fever is an acute affection, which, upon recovery, confers immunity against *T. parva*, but the author claims to have proved that *T. parva* causes a disease in cattle that, if it is not fatal, leaves after the first onset (which generally becomes chronic in calves and is always acute in adult animals) a latent infection that confers only a relative immunity. Animals harbouring this latent infection thus become reservoirs of the disease, from which ticks can be infected. The author's investigations have led him to conclude that *T. mutans* is identical with *T. parva*, and that, until proof to the contrary is obtained, *T. dispar* should be considered a variety of it [*cf. R.A.E.*, B, xiii, 17 ; xiv, 104].

[YAKIMOV (V. L.)] YAKIMOFF (W. L.) & others. **Piroplasmosis (Babesiellosis, Redwater) of Cattle in the North-west of Russia.**—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., c, no. 4–6, pp. 224–258. Jena, 30th October 1926.

This is a series of ten papers by the senior author and various collaborators. One of them deals with the spread of cattle piroplasmosis in Russia, particularly in the North-west. Both in European Russia and in the Caucasus and Turkestan the highest percentage of disease occurs in summer. In European Russia the vector is *Ixodes ricinus*, and the next highest percentage occurs in spring, while in the Caucasus and Turkestan *Boophilus annulatus calcaratus* is responsible, and the next highest percentage is in autumn. Another paper describes the disease on an estate in the government of Petrograd, where the pastures are wet, and the surrounding areas are also boggy and overgrown with shrubs and forests. These conditions favour *I. ricinus*, and this tick is very plentiful. In another outbreak in the same government, the cattle did not become infected in spring after being sent to graze, but in mid-summer during the heat. This is explained by the spring pasture being on high, dry land with few ticks. When the grass has been mown in mid-summer in low-lying, damp land the cattle are driven there and become heavily infested.

TOLDT, jr. (K.). **Ein typischer Herd von Menschenbefallenden leptusartigen Milbenlarven in Niederösterreich.** [A typical Centre of Man-infesting *Leptus* Mite Larvae in Lower Austria.]—*Wiener klin. Wochenschr.*, xxxix, no. 31, reprint, 9 pp. Vienna, 1926.

This is an account of an outbreak, of purely local character, of mites troublesome to man. The mite larvae concerned are stated to be *Microthrombidium pusillum*, Herm., while those in a previously noticed infestation in the Tyrol [*R.A.E.*, B, xii, 51] were *M. fahrenholzi*, Oudms. Both are commonly called *Trombicula* (*Leptus*) *autumnalis*, Shaw.

IMES (M.). **Lice, Mange, and Ticks of Horses, and Methods of Control and Eradication.**— *U.S. Dept. Agric.*, Farmers' Bull. 1493, 22 pp., 13 figs. Washington, D.C., June 1926. [Recd. November 1926.]

The sucking louse, *Haematopinus asini*, L., and the biting lice, *Trichodectes pilosus*, Gieb., and *T. parumpilosus*, Piag., are confined to horses, mules and donkeys. The eggs of *H. asini*, which are attached to the hairs close to the skin, hatch in 11–20 days, and the lice reach maturity in 11–12 days. These lice, which puncture the skin and suck the blood and lymph, pass their life on the host and can only live 2–3 days when removed from it. The eggs of the biting lice are deposited in the same manner, the incubation period varying from 8 to 10 days. These lice, which appear to feed on particles of hair, scales and exudations from the skin, may live as long as 10 days when separated from their host. All three species often occur in groups, particularly on the sides of the neck, under the jaws and round the flanks. The symptoms of infestation are described. When hair to which eggs are attached is removed and kept under favourable conditions, hatching may continue for 20 days, so that premises may remain infested for 25–30 days from the time they were occupied by infested horses. Although the lice seem to disappear in spring when the hair is shed, some remain on the host throughout the summer, and autumn dipping with arsenical solutions, coal-tar creosote or nicotine is, therefore, advised. A first dipping may not destroy all the eggs, so that a second is necessary after an interval of 14–16 days to kill lice hatched in the meantime before they begin to oviposit.

Dusting powders may be used to control biting lice, but do not as a rule eradicate sucking lice. These include sodium fluoride applied as a powder or mixed with water (1 oz. to 1 U.S. gal.). Oils and greases such as crude petroleum, crank-case oils, or equal parts of cottonseed oil and kerosene, which destroy lice, are not recommended for use on horses as they cause the hair to come out and often blister the skin. Fumigation with a concentration of 1 per cent. sulphur dioxide destroys the lice but not the eggs, so that a second treatment is necessary after two weeks. The advantage of this method is that it can be used when the weather is too cold for dipping, but a gas-tight enclosure is necessary and serious injury or death may result if the gas comes in contact with the eyes or nostrils, which must be treated by hand afterwards.

Sarcoptes scabiei equi, Gerl., the mite causing sarcoptic mange of horses, penetrates the upper layer of the skin and makes galleries in which mating and oviposition take place. The female lays 10–25 eggs over a period lasting probably from 12 to 15 days and then dies in the burrow. The eggs hatch in 3 to 10 days, and the young mites, after several moults, reach maturity and lay eggs in 10–12 days. The sarcoptic mange mites of the sheep, pig, camel, dog, cat and rabbit may live on horses, and those of the horse, dog and pig are readily transmissible to man. Any circumstance that lessens the vitality or functional activities of the horse hastens the spread and development of mange, and under favourable conditions the entire surface of the body may be covered with lesions in about six weeks. Both mites and eggs can live three weeks or longer away from their host, although normally they do not leave it. The symptoms of the disease are described. Four to six dippings, 5–7 days apart, in lime-sulphur or nicotine solution will usually effect a cure, especially if the affected areas are soaked well with warm dip and scrubbed with a

brush just prior to the first dipping. Crude oils and sulphur dioxide fumigation are also effective against mites ; their disadvantages have been mentioned above.

Psoroptes equi, Hering, lives on the surface of the skin throughout its life-cycle. Females lay 15–24 eggs, which hatch in 3–4 days, and the mites reach maturity and commence egg-laying in 10–12 days. They puncture the skin and probably introduce a poisonous secretion into the wound, which causes inflammation. The symptoms of the disease are described, and the principal differences between the sarcoptic and psoroptic mites are briefly discussed. Psoroptic mange of equines is not transmissible to other animals, but is more contagious to all classes of horses than sarcoptic mange. The remedies recommended for sarcoptic mange are effective, but since the psoroptic mite is more easily reached by the dip, two dippings 10–12 days apart will usually cure ordinary cases.

Chorioptes bovis equi, Gerl., closely resembles the psoroptic mite and produces similar lesions, though these are usually confined to the lower part of the limbs around the foot and fetlock, hence the common designation foot mange. The above-mentioned remedies are effective ; the affected areas should be well soaked in warm lime and sulphur dip at intervals of ten days until cured.

The information on the bionomics and control of *Ornithodorus megnini*, Dugés (spinose ear tick) has already been noticed from another source [*R.A.E.*, B, vii, 93].

Various methods of treating equines for external parasites are described, including dipping in arsenicals [*R.A.E.*, B, iii, 35], lime-sulphur or nicotine [vii, 104], proprietary coal-tar creosote dips and oil dips.

Report of the Departmental Committee on Warble Fly Pest.—*Minist. Agric. & Fisheries*, 48 pp., 12 refs. London, H.M.S.O., 1926. Price 1*s.* 6*d.*

This report summarises the investigations of the Warble Fly Committee from 1918 to 1926 and includes the results of experimental work carried out in Great Britain and Ireland from 1919 to 1924. A brief account of the life-history and habits of the warble flies, *Hypoderma bovis*, DeG., and *H. lineatum*, Vill., is given. With the exception of the Scilly Isles, which are entirely free from this pest, warble flies occur throughout England and Wales, and probably most of Scotland, being especially prevalent in low-lying districts. They are also very common in Ireland, whence many infested cattle are exported annually to southern Scotland, a fact that was of importance in connection with an attempt to eradicate warble flies from East Lothian. The infestation of permanent herds in this county is, however, low, probably partly because most of the heavily infested imported animals are fed in yards during the winter and are either sold for slaughter before the emergence of the warble larvae or kept in the yards until after their emergence, so that conditions are very unfavourable for successful pupation, and partly because the dry climate and well-drained soils of the pastures are also unfavourable in this respect.

The loss caused by warble flies owing to the lower value of infested hides has been estimated at between £400,000 and £500,000 in Great Britain in the worst years, which are those in which the spring and summer are dry. In addition to this they cause considerable losses

in meat, some of which is rendered unfit for human food, and milk, the yield of which is reduced, especially by loss of condition resulting from the attempts of cows to escape the ovipositing flies.

In control experiments the possibility of preventing oviposition by applying a repellent to the legs of cattle, on which the eggs are laid almost exclusively, was first investigated ; birch-tar oil was the most promising substance tested, but the results obtained from its use do not warrant recommending it ; condensed linseed oil dried too quickly. The subcutaneous injection of Arrhenal, a preparation of organic arsenic, into cattle to destroy first and second stage larvae gave negative results. Squeezing out and destroying mature larvae from the backs of cattle has exterminated the pest in one isolated area [*R.A.E.*, B, ix, 22], but the labour entailed in the process is considerable, and unless it is practised simultaneously over wide areas the treated animals must remain isolated or become re-infested. For this reason the bulk of the experimental work was devoted to the discovery of a simple, cheap and effective dressing for the destruction of larvae in the backs of cattle, that could be used on a large scale. The tobacco powder and lime dressing that was found successful in Ireland in 1920 and 1921 [*R.A.E.*, B, x, 164] was used with conspicuous success, and was tested in Scotland in 1922 and, on a large scale, in 1923, together with a proprietary preparation of derris, and lethol, a preparation containing 50 per cent. tetrachlorethane (by weight) [*R.A.E.*, B, xiii, 98]. The washes were applied to each warble, by means of a syringe, cloth, brush or sponge, the use of a stout brass syringe about 6 ins. long with a comparatively blunt nozzle being the surest method, although not generally favoured by farmers, partly because it called for some dexterity, and also required more time, as the dried exudate from the holes had sometimes to be removed. Over 80 per cent. of the several thousand warbles treated with 4 lb. tobacco powder and 1 lb. lime to 1 gal. water or with 1 oz. derris to 1 qt. water were killed, while 1 oz. derris in 1 pt. water, applied with a syringe, killed 95 per cent. Lethol is not inflammable and can be kept indefinitely, but the solution should be made up just before use ; it is not injurious to hair or hide ; applied at the strength of 1 part to 25 of water it killed 75 per cent. of the larvae, and at 1 to 10, 90 per cent. ; lethol with 5 per cent. liquid nicotine (98 per cent.) was slightly less effective than lethol alone [not more effective, as stated in a previous abstract].

Other preparations tested as dressings included mixtures of tar and paraffin oil and of linseed oil and carbon bisulphide, both of which were injurious to the animals. Denatured tobacco waste with lime or sodium carbonate was somewhat less effective than tobacco powder, especially when used with sodium carbonate. Nicotine and nicotine sulphate were used in an attempt to find a non-proprietary substance of known strength as effective as tobacco powder. Pure nicotine at 0·5 per cent. killed about 50 per cent. of the larvae and nearly 100 per cent. at 1·28 per cent. ; 1·4 lb. 40 per cent. nicotine sulphate in 10 gals. water gave from 75 to 100 per cent. control when combined with 10 lb. lime, 87 per cent. control with 10 lb. sodium carbonate, and 84 per cent. control with 20 oz. sodium carbonate. The superiority of tobacco powder and lime over pure nicotine is probably accounted for by lime producing a slow continuous liberation of nicotine from the powder, whereas the pure nicotine is very volatile. The results of the experiments with nicotine sulphate and lime, however, justify the recommendation of this preparation in addition to the tobacco

dust and lime mixture, the formula being 2 fluid oz. 40 per cent. nicotine sulphate, 1 lb. calcium hydrate, and 1 gal. water. Preparations of derris are also undoubtedly of great value and have the advantage of being easy to prepare. The tobacco dust and lime mixture does not keep well, but remains effective for about 6 days if kept in a closed receptacle.

Although the complete extermination of warble flies would be a difficult problem, destruction of larvae each year over any considerable area would do much towards reducing the pest to the verge of extermination, provided that infested cattle were not introduced. The most satisfactory method is the application of dressings to the warbles in the backs of cattle at intervals of 2–3 weeks from February to June, four, and probably five, applications being necessary. In applying the dressings it is important that the liquid should penetrate through the breathing hole into the cavity of the warble and reach the larva. No further action is normally required, as the dead larvae either wither and are absorbed or are ejected naturally, and the hole and surrounding infection heals over.

The legislation in force in Denmark and Belgium regarding the destruction of the larvae is summarised. In the opinion of the Committee legislation enforcing their destruction in Great Britain would be desirable if control over importation were practicable and if such measures were generally supported. Suggestions for further research are made.

KISHIGAMI (S.). **Influence of Larvae of Flies on Postmortem Degeneration and its Nature. Parts I and II.**— *Japan Med. World*, vi, nos. 8 & 9, pp. 199–207 and 232–236, 44 refs. Tokyo, 15th August and 15th September 1926.

The influence of fly maggots on the disintegration of dead bodies is discussed from the results of personal observations as well as a review of the literature. The presence of maggots hastens putrefaction owing to the presence of ferments in them.

RAFFENSPERGER (H. B.). **Horse Bots in Hog's Stomach.**— *Vet. Med.*, xx, no. 5, p. 225, 1 fig. Chicago, May 1925.

Fourteen larvae of *Oestrus* (*Gastrophilus*) *intestinalis* are recorded as having been found attached to the stomach-wall of a pig slaughtered at Chicago.

BEDFORD (G. A. H.). **The Sheep Ked** (*Melophagus ovinus* **Linné**).— *Jl. Dept. Agric. Union S. Africa*, xii, no. 5, pp. 484–490, 2 figs., 4 refs. Pretoria, September 1926.

An account is given of the life-history and habits of *Melophagus ovinus*, L. (sheep ked), and its effect on sheep. Like *Ornithodorus megnini*, Dug. (spinose ear tick), it has only recently become a serious pest in the Transvaal.

A number of proprietary dips for this parasitic fly are discussed and compared ; as a rule those containing arsenic are preferable. Lime and sulphur is too slow in action and tobacco dips are also not recommended. In the experiments keds which emerged from pupae that had not been destroyed by the dip were killed by the fluids that remained in the fleeces of the sheep, except occasionally in the

case of the tobacco preparations. This does not always happen, however, and three dippings would seem to be essential for complete eradication. The first dipping is the most harmful to sheep, but the effects are only temporary. Where dipping is done for keds alone, the second and third should be given at intervals of 14 days ; it is, however, usually advisable to dip for scab at the same time, in which case the second dipping should be given 9–10 and the third 24 days after the first.

The dipping operations are described.

Newman (L. J.) & Clark (J.). **Trapping Blowflies.**—*Jl. Dept. Agric. W. Australia*, 2nd Ser., iii, no. 3, pp. 382–391, 11 figs. Perth, W.A., September 1926.

As a result of experiments with various fly traps [*R.A.E.*, B, xii, 19 ; xiii, 54 ; xiv, 73] an improved one has been designed and is illustrated. In principle it is similar to one of those already noticed [xiv, 73]. It has a cone that can be removed when the trap requires emptying and thus obviates the necessity of a special opening for this purpose. The sides of the trap consist almost entirely of wire gauze, attached to a framework made by removing the top, sides and bottom of a kerosene tin except for a narrow margin at the corners. Small holes are made down either side of one of the corners, and the gauze is wrapped round the tin and fixed by copper wire through the holes. A gauze top is similarly attached. The reservoir for the bait is made from a second tin, cut down to a height of four inches from the bottom and placed under the trap. The top edges of the reservoir are splayed or bent in so that the trap fits over it. The trap is prevented from going too far down by a wooden stop on the inside. The fly entrances are made in the reservoir.

In the modified trap 118,000 blowflies belonging to 9 species were caught from 15th April to 14th May, as against 82,000 caught during the same period by the modified South African trap [xiv, 73]. The baits and conditions were similar in both cases.

Curran (C. H.). **The Distribution in Canada of the European Scavenger Fly, *Muscina pascuorum*, Mg.**—*Canad. Ent.*, lviii, no. 10, pp. 235–236, 3 refs. Orillia, Ont., October 1926.

The distribution of *Muscina pascuorum*, Mg., in North America, where it was first recorded in 1923, is described, its rapid rate of spread indicating that it will before long invade the whole of Eastern Canada and the United States, and probably the whole of temperate North America. The habits of this fly differ from those of the related species, *M. assimilis*, Fall., and *M. stabulans*, Fall., which occur in North America. It is found only in late summer and autumn and is supposed to feed on fungi of the genus *Amanita* and related genera, but it must be more or less of a scavenger, as it has been observed ovipositing on dead fish. This habit would account for its occurrence during the spring when fungi are not common. The adults are generally found in the vicinity of swamps, where they sip the honey-dew produced by Aphid colonies, and occur to some extent on flowers. *M. pascuorum* is by far the commonest of these species in houses, where of over 450 captured only 10 were males ; some field captures, however, yielded

a preponderance of males, and the indications are that females hibernate in houses, under bark, etc., while males are more numerous on foliage during August and September. In Canada, the flies did not enter houses to any noticeable extent until 1925. It is not anticipated that the fly will become a serious household pest, as it does not frequent food.

PATTON (W. S.). **The Ethiopian Species of the Genus *Musca* Linnaeus.**—*Rec. Indian Mus.*, xxviii, pt. 1, pp. 29–52, 4 pls. Calcutta, March 1926. [Recd. October 1926.]

This paper is not meant to be a final revision of the Ethiopian species of the genus *Musca*, but rather a practical guide to the identification of the species, short descriptions of which are given, with keys to both sexes.

SENIOR-WHITE (R.). **A Revision of the Sub-family Calliphorinae in the Oriental Region.**—*Rec. Indian Mus.*, xxviii, pt. 2, pp. 127–140, 1 fig., 11 refs. Calcutta, July 1926. [Recd. October 1926.]

Keys are given to the genera and species of the Oriental Calliphorines, including *Lucilia albopilosa*, sp. n., from North Bihar and Ceylon, and *Paratricyclea toxopei*, sp. n., from the Dutch East Indies.

[BARANOV (N.).] BARANOFF (N.). **Eine neue Simuliiden-Art und einige Bemerkungen über das System der Simuliiden.** [A New Species of Simuliid and some Notes on the Classification of Simuliids.]—*N. Beitr. syst. Insektenk.*, iii, no. 15–16, pp. 161–164, 1 fig., 6 refs. Berlin, 30th July 1926.

Adults, larvae and pupae of *Simulium* (*Odagmia*) *kondici*, sp. n., are described from Jugoslavia. The author follows Edwards and Friederichs as regards specific determination, but uses a simplified modification of Enderlein's classification for grouping the species, and gives on these lines a key to the European genera and subgenera.

HASE (A.). **Beiträge zur experimentellen Parasitologie. I. Ueber Verfahren zur Untersuchung von Quaddeln und anderen Hauterscheinungen nach Insektenstichen.** [Contributions to experimental Parasitology. I. On Methods for investigating Vesicules and other Conditions of the Skin after Insect Bites.]—*Zeitschr. angew. Ent.*, xii, no. 2, pp. 243–297, 21 figs., 77 refs. Berlin, November 1926.

The title of this paper indicates the nature of its contents. The diameters of the punctures made by hypodermic and other needles and by various insects are given, together with the areas of skin surfaces affected.

VON SCHUCKMANN (W.). **Zur Fliegen- und Mückenbekämpfung.** [On the Control of Flies and Mosquitos.]—*Zeitschr. angew. Ent.*, xii, no. 2, pp. 332–339, 6 refs. Berlin, November 1926.

A proprietary fumigant that gives off gases consisting mainly of sulphur dioxide is recommended for use against flies in buildings.

Experiments with wire gauze of various meshes show that one of $1\frac{3}{4}$ mm. width is sufficient not only against *Musca domestica*, L., and *Stomoxys calcitrans*, L., but also against smaller flies such as *Fannia scalaris*, F. Though some individuals of *Culex* succeeded in getting through this mesh, in practice it will probably prove effective against mosquitos, and a gauze of smaller mesh (1·25 mm.) need only be used where malaria occurs and Anophelines must be definitely excluded.

Breinl (F.). **Studies of Typhus Virus in the Louse.**—*Jl. Infect. Diseases*, xxxiv, no. 1, pp. 1–12. Chicago, Ill., 1924.

With Weigl's method of injecting lice [*Pediculus humanus*], it is possible to pass typhus virus from louse to louse repeatedly. It multiplies considerably within the louse, but does not become more virulent. The body of the louse contains only small quantities of virus after the intestines have been removed, and this supports the view that natural infection in man is caused by contact with the intestines of crushed lice or with their faeces.

Lambert (S. M.). **Health Survey of Western Samoa, with Special Reference to Hookworm Infection.**—*New Zealand. Mandated Territory of Western Samoa, Ann. Rept. Dept. Health for the Year ended 31st March 1925*, pp. 25–37. Wellington, 1925.

Pediculus capitis, DeG., is common throughout Samoa, and in some districts the houses are infested with *Cimex hemiptera*, F. (*rotundatus*, Sign.). Filariasis is widespread, but of the six species of mosquito found only one, *Aëdes variegatus*, Dol. (*Stegomyia pseudoscutellaris*, Theo.) has been shown to be the intermediate host. It bites at any time of the day, but is most active about sunset.

Violle (H.). **De l'acide cyanhydrique comme agent de dératisation et de désinsectisation à bord des navires.**—*Rev. Hyg.*, xlviii, no. 4, pp. 304–320, 1 fig. Paris, April 1926.

The fumigation of ships with hydrocyanic acid gas is not permitted in France owing to the danger attending its use, but an account is given of experiments carried out for the authorities with a view to a reconsideration of this question. A closed form of generator is described in which the gas is produced by the action of sulphuric acid on sodium cyanide. Rats, mice, bed-bugs [*Cimex*] and cockroaches were killed by an exposure of about $1\frac{1}{4}$ hours, about 4 oz. of sodium cyanide being used for 1,000 cu. ft. of space. It is recommended that the use of this fumigant be permitted under certain conditions.

Violle (H.). **De la chloropicrine comme agent de dératisation à bord des navires.**—*Rev. Hyg.*, xlviii, no. 6, pp. 502–513, 1 ref. Paris, June 1926.

Experiments in the fumigation of ships with chloropicrin are described, the conclusion reached being that the French authorities should permit the use of this substance.

Dampf (A.). **Kritisches Verzeichnis der Aphaniptera Deutschlands.** [An annotated List of German Siphonaptera.]—*Ent. Mitt.*, xv, no. 5–6, pp. 377–386. Berlin, 10th October 1926.

This is a list of the 50 species of fleas recorded from Germany with information on their hosts and the distribution.

Jordan (K.). **New Siphonaptera.**—*Nov. zool.*, xxxiii, no. 3, pp. 385–394, 22 figs., 3 refs. Tring, 8th December 1926.

The fleas described include *Delopsylla crassipes*, gen. et sp. n., from *Pedetes surdaster larvalis* in Nairobi, *Ceratophyllus tribulis*, sp. n., from fowls in East Turkestan, *Stivalius rhaebus*, sp. n., from *Sciurus brooksi* in Borneo, *S. spiramus*, sp. n., from *Rattus quereci* in the Philippines, and *Ctenophthalmus moratus*, sp. n., from *Typomys trivirgatus* in Ashanti.

[Wagner (J. N.).] **Вагнер (Ю. Н.). On Aphaniptera collected in 1913 in the Steppes of South-East Russia.** [*In Russian.*]—Arkhiv Biol. Nauk [*Arch. Biol. Sci.*], xxvi, pt. 1–3, pp. 103–113. [Leningrad, ? 1926.]

Notes are given on the fleas taken on rodents and in their nests in the Volga region [*R.A.E.*, B, xiv, 67, 99, 151] with a key to the new species [xiv, 151].

Citellus musicus and *C. mugosauricus* are the principal hosts of *Ceratophyllus tesquorum*, Wagn., and *Neopsylla setosa*, Wagn., while *C.* (*Ophthalmopsylla*) *volgensis*, Wagn. & Ioff, and *Mesopsylla tuschkan*, Wagn. & Ioff, mainly occur on *Alactaga saliens*. The hosts may occasionally be interchanged, though this is apparently rare, and the fleas probably do not remain for long on the unusual host.

N. setosa is definitely recorded as able to bite man.

Lister (Sir F. S.). **Annual Report for the Year 1925 of the South African Institute for Medical Research.**—37 pp., 2 figs. Johannesburg, 1926.

In the course of this report a brief account is given of the entomological work in connection with plague investigations. In July, a record of the fleas found on the house rats of Johannesburg was begun ; so far it indicates a considerable seasonal variation in the numbers of *Xenopsylla cheopis*, Roths. Of the commoner fleas occurring on veldt rodents *Dinopsyllus lypusus*, J. & R., and *Chiastopsylla rossi*, Watrst., have been proved capable, under experimental conditions, of transmitting plague from artificially-infected rodents to healthy animals. After being starved for 2–3 days both of these fleas fed on man.

Gowdey (C. C.). **Catalogus insectorum jamaicensis.**—*Dept. Agric. Jamaica*, Ent. Bull. 4, pt. 1–2, iv, 114, xiv, 10 & ii pp. Kingston, 1926.

This catalogue includes lists of the mosquitos and other insects injurious to man and animals in Jamaica. In some cases synonymy is given and hosts are mentioned.

Ribeiro (R.). **O berne.** [The Larva of *Dermatobia hominis*.]—*Correio agric.*, iv, no. 9, pp. 257–260. Bahia, September 1926.

In the Brazilian State of Bahia cattle are infested, sometimes with fatal results, by the larvae of *Dermatobia hominis*, Say (*cyaniventris*, Macq.), especially in rainy years. The larvae are unable to burrow into hard ground for pupation and die in a few hours, whereas they burrow readily in moist, loose soil. The pupal stage lasts 20–30 days. Eggs are laid on the leaves of bushes or directly on the cattle, or may be attached to, and carried to the cattle by, mosquitos or other flies. It is possible that *D. hominis* may sometimes be viviparous, depositing larvae directly on the host. Animals with light-coloured coats are not infested to the same degree as those with dark coats. The life of the larva under the skin is said to last 50–140 days. The measures to be taken include removal of the larvae, the dressing of the wound with an ointment containing creoline, and the use of one of the usual tick dips.

Galliard (H.) & Coutelen (F.). **Présence en France de** *Culex tipuliformis* **Theobald 1901.**—*C.R. Soc. Biol.*, xcv, no. 30, pp. 1025–1026. Paris, 29th October 1926.

Culex tipuliformis, Theo., is recorded from the eastern Pyrenees, where it was found breeding in pools in a dried-up river-bed. It has also been found in Spain.

Dios (R. L.) & Zuccarini (J. A.). **Existence du** *Triatoma oswaldoi* **(Neiva et Pinto) en Argentine.**—*C.R. Soc. Biol.*, xcv, no. 30, p. 1088. Paris, 29th October 1926.

Triatoma oswaldoi, Neiva & Pinto, is recorded from Argentina.

Rodhain (J.). *Herpetomonas rhinoestri*, **sp. n., parasite des larves de** *Rhinoestrus nivarleti*, **Rodh. et Beq.**—*C.R. Soc. Biol.*, xcv, no. 31, pp. 1124–1127, 1 fig., 3 refs. Paris, 5th November 1926.

The flagellate found in larvae of *Rhinoestrus nivarleti*, R. & B., infesting *Potamochoerus porcus* in the Belgian Congo, which was previously recorded as allied to *Herpetomonas oestrorum* [*R.A.E.*, B, v, 50], is now described as *H. rhinoestri*, sp. n.

Rodhain (J.). **Le mode de transmission de** *Herpetomonas rhinoestri* **Rod.**—*C.R. Soc. Biol.*, xcv, no. 31, pp. 1128–1130. Paris, 5th November 1926.

Herpetomonas rhinoestri, which is found in the intestinal tract of the larvae of *Rhinoestrus nivarleti*, R. & B., has been recovered from the ovaries of the adult fly. Infection is therefore presumably acquired by the larvae just before they are deposited by the parent.

Nitzulescu (V.). **Sur l'armature buccale des Tabanidés.**—*C.R. Soc. Biol.*, xcv, no. 32, pp. 1152–1154, 1 fig., 4 refs. Paris, 12th November 1926.

The object of this paper is to point out that the buccal armature of Tabanids more closely resembles that of *Phlebotomus* than that of

mosquitos, as has been generally stated, a fact that was apparently first noticed by Porchinskii (1906). The author's observations were made on *Haematopota pluvialis*, L., which is abundant in the forests near Paris.

Symons (T. H.). **Tick-fever due to *Piroplasma gibsoni* Patton in a Kennel of Foxhounds in India.**—*Ind. Jl. Med. Res.*, xiv, no. 2, pp. 293–315. Calcutta, October 1926.

In 1909–1912 Patton attempted unsuccessfully to transmit piroplasmosis (*Piroplasma gibsoni*) from jackals to healthy dogs by means of *Haemaphysalis bispinosa*, Newm., but a species of *Rhipicephalus* is also fairly common on jackals and may be the natural carrier of this disease to foxhounds in India.

An account is given of the care of hounds with a view to preventing infection.

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). **Note on a Massive Infection of the Buccal Cavity of *Phlebotomus argentipes* with *Herpetomonas donovani*.**—*Ind. Jl. Med. Res.*, xiv, no. 2, pp. 329–330, 1 pl., 2 refs. Calcutta, October 1926.

Further examintion of a large number of infected *Phlebotomus argentipes*, Ann. & Brun., confirmed, in the majority of cases, previous observations that the furthest point of advance of the massive portion of the flagellate growth of *Leishmania* (*Herpetomonas*) *donovani* was up to the junction of the pharynx with the buccal cavity [*R.A.E.*, B, xiv, 144]. One specimen, however, showed a considerable advance on this condition. The massive growth of flagellates, continuous with the proventricular growth, extended in an unbroken column throughout the length of the pharyngeal and buccal cavities up to the mouth proper, where the biting appendages take origin, the most anteriorly placed flagellates extending even further. The fly had only received two feeds and was examined on the ninth day after the initial feed. It would appear that the intensity of infection and the extent of its development depends on the initial number of parasites ingested from the peripheral blood, as well as on the time that has elapsed since the initial feed. Flies in the condition described would certainly infect the wounds made by feeding should they be given a third feed.

The massive growth of flagellates, in this, the most advanced infection so far seen, was comprised, especially in the most anterior parts, mainly of elongate flagellates and not of the rounded Row's bodies that have been assumed to be the most infective form.

Barraud (P. J.). **A Revision of the Culicine Mosquitoes of India. Part xviii. The Indian Species of *Uranotaenia* and *Harpagomyia*, with Descriptions of five New Species.**—*Ind. Jl. Med. Res.*, xiv, no. 2, pp. 331–350, 1 pl. Calcutta, October 1926.

In this continuation of previous papers [*R.A.E.*, B, xiii, 14], a key is given to the Indian species of *Uranotaenia*, which include *U. christophersi*, sp. n., from the Andaman Islands; *U. edwardsi*, sp. n., *U. orientalis*, sp. n., and *U. annandalei*, sp. n., from Assam; and *U. stricklandi*, sp. n., from the eastern Himalayas and the Nilgiri Hills, South India. A specimen in the Indian Museum from Lower Burma is apparently *U. annandalei*.

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). **The Occurrence in Nature of *Phlebotomus argentipes* infected with a Flagellate morphologically identical with *Herpetomonas donovani*.**—*Ind. Jl. Med. Res.*, xiv, no. 2, pp. 521–522, 2 refs. Calcutta, October 1926.

A single individual of *Phlebotomus argentipes*, Ann. & Brun., caught in Bihar in July was found to be infected with flagellates morphologically identical with those of *Leishmania* (*Herpetomonas*) *donovani*. A massive grouping of the flagellates occurred in the region of the proventicular fold, exactly as was found in flies fed under artificial conditions [*R.A.E.*, B, xiv, 144]. No flagellates were seen anterior to this mass. This record suggests that in the area from which the fly was obtained infection with the parasite of kala-azar may be acquired during the monsoon period, if the sandfly is the transmitting agent.

Kelsall (A.), Spittall (J. P.), Gorham (R. P.) & Walker (G. P.). **Derris as an Insecticide.**—*56th Ann. Rept. Ent. Soc. Ontario, 1925*, pp. 24–40. Toronto, 1926.

In the course of an investigation of the insecticidal properties of derris [*R.A.E.*, A, xv, 34] experiments were made to test its effect on house-flies (*Musca domestica*, L.) and bed-bugs (*Cimex lectularius*, L.). House-flies on the wing and at rest, sprayed with derris, 5 lb. in 100 gals. water, became restless almost immediately and began to clean themselves vigorously; most of them died within 24 hours, and all, so far as could be ascertained, within 48 hours. House-flies dusted with derris were all alive after 1 day, but it is probable, in view of other experiments, that although the dust was slower in action it produced some mortality subsequently. Bed-bugs confined in a vial with derris dust were active for 2 hours, but were all dead after 3½ hours.

Castillo (N.). **Preliminary Studies on the Insecticidal Properties of three Species of *Derris* in the Philippines.**—*Philipp. Agriculturist*, xv, no. 5, pp. 257–275, 1 fig., 30 refs. Los Baños, October 1926.

Derris philippinensis was used in preliminary experiments against mosquito larvae, as it is relatively more abundant than other species in the Philippines and therefore more easily procurable. The pounded dried roots were dissolved in water, which was placed in a jar, about 2 cm. from the bottom of which a strainer of cheesecloth was fixed by means of a bamboo frame, so that any sediment might fall through and the effect produced on the larvae would be entirely due to the aqueous solution. When the sediment had settled, the larvae were placed in the jar. A concentration of 3 gms. of the powder to 1,000 cc. of water gave the best results, both weaker and stronger solutions being less effective. Subsequently, however, when eggs were laid in solutions of from 3 : 1,000 to 10 : 1,000 very few of the resulting larvae reached the adult stage. Apparently as a result of the gradual deterioration and consequent weakening of the toxic principle, the higher concentrations were eventually brought down to the optimum level, and thus became effective later. Concentrations of 3 : 1,000 and higher retain their toxicity against mosquito larvae for 13–16 days. In comparative tests with *Derris polyantha*, and *D. elliptica* at concentrations of 3 : 1,000, *D. polyantha* killed all larvae after 1 day, *D. philippinensis* after 5 days and *D. elliptica* after 7–9 days.

(K3199) Wt P5/35 1,500 2/27 H & Sp Gp 52

When the water was uncovered after the larvae had died, eggs were found after 1–2 days on the surface of the waters containing *D. elliptica* and *D. philippinensis*, whereas on those containing *D. polyantha* they were not observed until after 13–16 days. Moreover in the last-named most of the eggs failed to produce adults or even larvae, while in the other two the insects appeared to develop normally.

MARCHOUX (E.). **Paludisme.**—*Nouveau Traité Méd. & Thérap.*, v, 366 pp., 135 figs. Paris, J. B. Baillière & Fils, 1926. Price *Fr.* 76.

In this text-book the mosquito hosts of the malaria parasite are discussed at length, particulars of their structure, comparative morphology and biology being given, together with information on their capture, preparation as specimens, and dissection.

A chapter on prophylaxis includes an account of the various measures against mosquitos.

SÉGUIN (—). **Projet de plan de campagne antipaludique applicable à La Réunion.**—*Rev. prat. Maladies Pays chauds*, vi, no. 1, pp. 22–41. Paris, March 1926. [Recd. October 1926.]

A general plan of campaign against malaria, as applicable to the Island of Réunion, is outlined, and the usual anti-mosquito measures are enumerated.

BEYER (G. E.). **Two Species of Louisiana Mosquitoes resistant to the usual Eradication Methods.**—*Qtrly. Bull. Louisiana State Bd. Health*, xvi, no. 3, pp. 148–157, 2 figs. New Orleans, September 1925.

Owing to the their unusual breeding habits, *Taeniorhynchus* (*Mansonia*) *perturbans*, Wlk., and *Aëdes sollicitans*, Wied., cannot be dealt with by the usual methods for mosquito eradication. The life-cycle of the former occupies a year, the larvae and pupae living on plant stems under water and breathing air obtained from the air-cells of the plant-roots. In Louisiana this mosquito is on the wing in March and April.

A. sollicitans, which can fly for longer distances than any other American mosquito, breeds in brackish water ; its eggs can withstand desiccation, and the larvae and pupae can survive in wet earth.

GRIFFITTS (T. H. D.). **Method of applying Oil under Pressure as a Larvicide.**—*Public Health Bull.*, no. 156, pp. 15–19, 7 figs. Washington, D.C., August 1925.

Oil, applied under pressure, has given good results against *Anopheles quadrimaculatus* breeding among floating débris in large lakes. The apparatus consists of a 40-U.S. gallon tank, which is charged with 25 U.S. gals. of kerosene and 120 lb. air pressure, supplied by a small motor and air compressor, or 80 lb. in cases where a hand pump for tyre inflation on cars is used. Upon releasing the compression stop, the

spray nozzle delivers a very fine spray. A gentle breeze can carry the mist for a distance of 200 feet to form a complete film on the water surface. The apparatus is installed in a boat.

GAGE (E. H.). **Observations on the Passage of Anopheline Mosquitoes through Screens of various-sized Mesh.**—*Public Health Bull.*, no. 156, pp. 44–48. Washington, D.C., August 1925.

The experiments described indicate that *Anopheles crucians* cannot pass through 14 or 16 mesh wire gauze. *A. quadrimaculatus* and *A. punctipennis* cannot pass through 12 mesh wire gauze, but 4 out of 237 females of *A. crucians* succeeded in doing so.

COOGLE (C. P.). **Mosquito Repellents and Mosquitocides.**—*Public Health Bull.*, no. 156, pp. 136–137. Washington, D.C., August 1925.

Success has attended the use of creosote as a repellent in a pressure spray at the rate of 1 U.S. gal. per 450 square feet on the interior walls of unscreened and dilapidated houses [*R.A.E.*, B, xi, 97]. Eight weeks is the longest recorded time during which mosquitos were actually kept out of houses by this means. In the subsequent discussion it was stated that while this process will immensely diminish the numbers of *Anopheles quadrimaculatus* resting in a room, it will not prevent some individuals from entering and sheltering during the day.

KIBBEY (C. H.). **Larvicides.**—*Public Health Bull.*, no. 156, pp. 141–142. Washington, D.C., August 1925.

Nearly all the distillates from petroleum or coal-tar are definitely toxic to mosquito larvae, the higher distillates tending to be the more strongly larvicidal. Thus, petrol is the most effective of all the petroleum products, while benzol bears the same relation to the coal-tar products. The routine use of a larvicide should be avoided until each particular mosquito has been studied, when the locally appropriate measures can be taken. The breeding of *Anopheles quadrimaculatus* in a large reservoir covered with algae, where a chemical larvicide was out of the question, was dealt with by clearing the algae and producing wave action by the daily cruising of a motor boat. Two boats have been worn out in this service, and a third has been working for some two years. Malaria is now unknown in the district.

HEARLE (E.). **The Mosquitoes of the Lower Fraser Valley, British Columbia, and their Control.**—*Canada: Nat. Res. Council*, Rept. 17, 94 pp., 14 pls., 30 refs. Ottawa, 1926.

This is an account of the author's work in the Lower Fraser Valley, begun in 1919, prior to which date very little was known in that area respecting mosquitos and their distribution. Much of the information has already been noticed from other sources [*R.A.E.*, B, viii, 140; ix, 86, 141; x, 64, 127; xii, 165]. The topography of the country is described, and a list of the mosquitos is given, with notes on their breeding-places and general habits.

Wellington (A. R.). **The Ways and Means adopted by Government for the Control of Malaria in the Federated Malay States.**—*Malayan Med. Jl.*, i, no. 3, pp. 16–20. Singapore, September 1926.

This paper has already been noticed from another source [*R.A.E.*, B, xiv, 161].

Anti-malarial Work in Straits Settlements.—*Malayan Med. Jl.*, i, no. 3, pp. 27–31. Singapore, September 1926.

These notes are taken from the local detailed reports incorporated in the Annual Report of the Medical Department of the Straits Settlements, the malaria situation in each district being discussed. A survey of some of the regions showed *Anopheles maculatus* to be the most important species and to be present in large numbers, though *A. vagus* was much the most numerous species. A special survey of the Anophelines of rice-fields is included.

Dickinson (R. F. O'T.). **The Incubation Period in Malaria.**—*Jl. R.A.M.C.*, xlvii, no. 5, p. 381. London, November 1926.

The incubation period of malaria is usually stated to be about two weeks, and in the author's experience 12–14 days elapse between the bite of the mosquito and the development of symptoms. In the present case, however, recorded from Mauritius, an attack of malignant tertian appeared exactly 7 days after the patient had been exposed to the attack of *Anopheles gambiae*, Giles (*costalis*, Theo.).

Jaarverslag der wetenschappelijke Malariacommissie voor Noord-Holland over 1924. (Uitgebracht aan den Minister van Arbeid, Handel en Nijverheid.) [Report for 1924 of the Scientific Malaria Commission for the Province of North Holland. (Rendered to the Minister of Labour, Commerce & Industry.)]—34 pp., 22 refs. [Amsterdam ?] 1925.

Examinations made throughout the year showed that in winter *Anopheles* [*maculipennis*] feeds in houses as well as in stables. At Amsterdam satisfactory results were obtained against adults in stables with a spray prepared by dissolving 75 lb. soft soap and 25 lb. soda in 100 gals. water, which is then boiled for 10 minutes, 3 lb. liquid ammonia being added after cooling. A Dutch proprietary insecticide containing petroleum with 6–8 per cent. of carbon tetrachloride and 3·4 per cent. of methyl salicylate, and an American preparation containing petroleum with 3·2 per cent. of methyl salicylate and a yellow dye, also proved satisfactory in experiments against adults in stables. These substances appear to be superior to lysol. According to J. van der Hoeven, malaria follows any considerable admixture of sea-water with fresh water, and if the inland waters in Holland could be kept free from sea-water, the disease would disappear. His theory is that brackish water hinders the development of Anopheline larvae, and that the resulting adults are unable to penetrate the hide of animals and are thus forced to attack man. While not admitting that this

theory is proved, the Commission recognises the fact that during the past 25 years malaria in Holland has been limited to the provinces where brackish water occurs.

Jaarverslag der wetenschappelijke Malariacommissie voor Noord-Holland over 1925. (Uitgebracht aan den Minister van Arbeid, Handel en Nijverheid.) [Report for 1925 of the Scientific Malaria Commission for the Province of North Holland. (Rendered to the Minister of Labour, Commerce & Industry.)]—33 pp., 27 refs. [Amsterdam ?] 1926.

In 1925 the first larvae of *Anopheles* [*maculipennis*] were seen on 21st April and the first males on 4th June, indicating the hatching of a new brood. Adults containing blood occurred in all the colder months in stables, and in dwellings December was the only month in which none were found.

Oiling was done on a large scale, the paraffin used being much superior to petroleum, but being too costly for general use in land reclaimed from the sea. Besides the proprietary insecticides recorded in the preceding report, other preparations were tested, but did not appear to be an improvement on them.

An observation on local races of *A. maculipennis* has already been noticed [*R.A.E.*, B, xiv, 82].

DE BUCK (A.). **De variatie bij *Anopheles maculipennis* in verband met het "Anophelisme zonder Malaria."** [Variation in *A. maculipennis* in connection with Anophelism without Malaria.] —83 pp., 11 figs., 44 refs. Amsterdam, Universiteitsboekhandel, 1926.

The observations described in detail in this thesis were made in Holland, chiefly in districts south of Amsterdam. Two types of *Anopheles maculipennis*, Mg., were found, a large and a small one. Roughly, the large type occurs south of a very irregular line drawn eastwards from the coast near Leyden ; the small type is found to the north of this line. In general, the large mosquito has a smaller number of maxillary teeth than the small one. The two types also occur in Friesland, the smaller along the coast and the larger inland. The author was unable to discover that the salt-content of the breeding-places had any influence on the production of these types. The mosquitos of the early summer generations of 1926 were larger than those that had hibernated in the preceding winter. During the summer two breeding-places were found, one in the large and the other in the small type areas, where the size was that of the hibernated generation. Later on the size again increased. It is not known whether size is affected by the temperature prevailing during the larval stage, but in any case the circumstance mentioned above cannot be explained by temperature. It is very probable that the large and small types represent different races.

Malaria is chiefly confined to the area of the small type, but does not occur everywhere where this mosquito is found. Mosquitos of the large type sometimes attack man, but not so readily as do those of the small one.

Methods of studying Malaria Mosquitos. [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 6–7, pp. 3–5. Moscow, 1926.

In order to ascertain the actual importance of individual species of mosquitos in the distribution of malaria in Russia, experiments in infecting them with malarial parasites are needed, and the methods of doing this are briefly described.

[Dobradin (—).] **Добрадин (—). Malaria in the Rural Districts of the Enissei Government.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 6–7, pp. 19–26, 1 fig. Moscow, 1926. (With a Summary in French, pp. 78–79.)

Details are given of a malaria survey and of prophylactic measures conducted in the rural districts of the Enissei Government, Siberia. Though no actual entomological work was carried out, a number of mosquitos were collected, including *Anopheles bifurcatus*, L., and *A. maculipennis*, Mg.

[Dobronravov (V. N.).] **Добронравов (В. Н.). The Question of the Causal Agent of "Creeping Disease." A Case of "Creeping Disease."** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 6–7, pp. 41–46, 2 figs., 7 refs. Moscow, 1926. (With a Summary in French, p. 79.)

A larva of *Oestrus intestinalis*, DeG. (*Gastrophilus equi*, Cl.) was removed from the instep of a patient, and when placed in a suitable medium it continued its burrowing movements for 24 hours. The larva and its movements are described. The mode of infection is not known, but it is suggested that in the present case the egg entered a pore of the skin as a result of friction or some other means, and that the ensuing larva eventually burrowed under the skin (apparently $2\frac{1}{2}$ months after infection). The infection probably occurred during field work when the patient was barefoot.

The Malaria Commission in Spain.—*Brit. Med. Jl.*, no. 3442, p. 1237. London, 25th December 1926.

The planting of *Chara foetida* and *C. fragilis* in streams to destroy Anopheline larvae does not appear to be of much value; but better results have been obtained from the use of the fish, *Gambusia*, which was introduced from the United States in 1921, feeds freely on the larvae, and seems to have become well acclimatised. Rice-fields, such as those in Valencia and Tortosa, are not thought to be specially dangerous breeding-places, provided that their irrigation systems receive careful attention. The lower the social and economic condition of the people, the higher is the malaria rate. The seasonal movements of agricultural workers have a notable effect in disseminating the disease. The vector of malaria, of which the most prevalent form is benign tertian, although quartan fever is common, is *Anopheles maculipennis*, Mg. The disease in general is not of a severe type, and its incidence has declined in recent years.

DE BARROS BARRETO (J.) & DE ALMEIDA (E.). **Malaria e habitação. Fundamentos da lucta em domicilio contra os anophelineos adultos, particularmente pelos expurgos periodicos.** [Malaria and Dwellings. The Bases of Work Indoors against adult Anophelines, especially by means of periodical Disinfestations.]—*Sciencia med.*, iv, no. 11, pp. 577–587. Rio de Janeiro, 30th November 1926.

This is a review of the literature dealing with the house as an epidemiological factor in malaria and with the principles on which work indoors against adult Anophelines is based.

BOYD (M. F.). **Studies of the Epidemiology of Malaria in the Coastal Lowlands of Brazil, made before and after the Execution of Control Measures.**—*Amer. Jl. Hyg.*, Monogr. Ser., no. 5, v+261 pp., 33 figs., 20 refs. Baltimore, Md., May 1926.

A full account is given of an anti-malarial campaign conducted from 1922 to 1925 in three villages in the lowlands of the State of Rio de Janeiro. The settlement of this area dates back to the early colonial period. Abandonment of agriculture and drainage followed the abolition of slavery, with a consequent extension of malaria. The following Anophelines were found: *Anopheles* (*Cycloleppteron*) *mediopunctatus*, Theo., *A.* (*C.*) *rockefelleri*, Peryassú, *A.* (*C.*) *intermedius*, Chagas, *A.* (*C.*) *maculipes*, Theo., *A.* (*C.*) *pseudomaculipes*, Chagas, *A.* (*Cellia*) *albimanus*, Wied., *A.* (*C.*) *tarsimaculatus*, Goeldi (*oswaldoi*, Peryassú), *A.* (*C.*) *brasiliensis*, Chagas, *A.* (*C.*) *argyritarsis*, R.-D., and *A.* (*C.*) *argyritarsis* var. *alloplia*, Lutz & Peryassú. *A. cruzi*, D. & K. (*lutzi*, Theo.) was met with outside the zone of study. A comparison of the nomenclature of Peryassú and Dyar for the species encountered is made. In the author's opinion *A. rockefelleri* is probably only a variety of *A. mediopunctatus*; *A. alloplia* certainly, and *A. brasiliensis* possibly, are to be regarded as varieties of *A. argyritarsis*; and *A. oswaldoi* is a synonym of *A. tarsimaculatus*.

In the area investigated *A. argyritarsis* was the principal vector of malaria, having a great predilection for human blood, while *A. tarsimaculatus* played a secondary part. *A. brasiliensis* is probably a vector, but this has not been confirmed. The chief measure employed against the larvae was drainage by means of open ditches. The utility of stream-cleaning is doubtful, owing to the high cost of maintenance, though it favours the activities of larvicidal fish. Top-minnows, especially *Poecilia vivipara*, were probably the most important factor, next to drainage, in the degree of control secured. Larvicides (oil or Paris green) were employed only where their use was indicated by the routine inspections. The results achieved were very satisfactory at two of the villages. At the third malaria was reduced, but not eliminated, owing to the difficulty of controlling certain breeding-places caused by floods.

MOORE (H. W. B.). [**Notes on Mosquitos.**]—*The Daily Argosy*, cxii. Georgetown, Br. Guiana, 11th & 26th August, 29th September, 20th October 1926.

This is a popular account of observations on mosquitos in British Guiana. *Anopheles* (*Cellia*) *tarsimaculatus*, Goeldi, was very abundant

in 1926. It undoubtedly lays a greater number of eggs than has been commonly supposed. In one case as many as 435 eggs were laid by one individual ; they were deposited in three batches after three successive blood-meals. The period between feeding and oviposition varies from rather less than 2 to 3 days, the incubation period occupying about the same time. Apparently the eggs cannot withstand prolonged desiccation. A short descriptive account is given of the larvae.

Aëdes taeniorhynchus, Wied., also occurred in large numbers. In experiments the eggs of this species, though unable to withstand complete desiccation, hatched after remaining on drying mud for 2 months, when water was added. It is believed that the moisture absorbed by the mud from the surrounding atmosphere was sufficient to preserve the eggs. Though under natural conditions the eggs would be subject to long periods of desiccation, the conditions would be somewhat relieved by occasional rains and dew.

DYAR (H. G.). **Notes on Panama Mosquitoes (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xiv, no. 7–9, pp. 111–114. Washington, D.C., 8th November 1926.

These notes all refer to the Panama Canal Zone. *Sabethes cyaneus*, F., has been bred from a tree-hole, the larvae being associated with those of *Aëdes terrens*, Wlk., and *Culex declarator*, D. & K., on which they are probably predacious. The male of *A. septemstriatus*, D. & K., also bred from tree-holes where the larvae were associated with those of *Haemagogus lucifer*, H., D. & K., is described. Both sexes and the larva of *Culex* (*Choeroporpa*) *curryi*, sp. n., from a rock pool are described ; it is closely allied to *C. educator*, D. & K. A description is also given of the larva of *Culex* (*Melanoconion*) *bifoliatus*, Dyar, from a tree-hole, where it occurred in company with the larvae of *C. declarator*, D. & K., and *C. inflictus*, Theo.

STEWART (M. A.). **Two New Siphonaptera from New York.**—*Insecutor Inscitiae Menstruus*, xiv, no. 7–9, pp. 122–126, 1 fig. Washington, D.C., 8th November 1926.

The fleas described are *Trichopsylla lotoris*, sp. n., from a racoon (*Procyon lotor*), and *Neopsylla striata*, sp. n., from the nest of a chipmunk (*Tamias striatus*), both from New York State.

DYAR (H. G.). **Note on** *Corethrella appendiculata* **Grabham (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xiv, no. 7–9, p. 150. Washington, D.C., 8th November 1926.

Corethrella ananacola, sp. n., bred from water in the leaf-bases of wild pineapple (*Ananas magdalenae*) in the Panama Canal Zone, differs in the immature stages, which are described, from *C. appendiculata*, Grabh., which also occurs in Panama, and breeds in tree-holes, though the adults are similar.

BROMLEY (S. W.). **Killing Mosquitoes with Cyanogas Calcium Cyanide.**—*Jl. Econ. Ent.*, xix, no. 6, p. 871. Geneva, N.Y., December 1926.

Calcium cyanide " A " dust [*R.A.E.*, A, xiv, 74] has been tried against mosquitos in sheds. The application was made at a relative humidity of 96 per cent. and a temperature of 75° F. The dust was

directed into corners and on all objects in the shed, and also on to the floor so that any mosquitos that dropped to the ground would still be exposed to the fumes. The entire space was filled with a fog of dust. Various insects besides mosquitos were killed, but the dust did not affect spiders in webs near the eaves.

SMILLIE (W. G.). **Studies of an Epidemic of Malaria at the Gantt impounded Area, Covington County, Alabama.**—*Amer. Jl. Hyg.*, vii, no. 1, pp. 40–72, 9 figs., 6 charts, 2 maps. Baltimore, Md., January 1927.

These observations covered a period of three years, one previous to the impounding of the water and two subsequently. Malaria was not prevalent previous to impounding and the Anopheline incidence did not increase for the first eight months (November–June). After the beginning of June, *Anopheles quadrimaculatus*, Say, began breeding in the impounded water and invaded houses within a radius of a mile. Malaria occurred in direct proportion to the abundance of this species and ceased in October, when it disappeared. Wherever *A. quadrimaculatus* was successfully controlled, malaria disappeared, whereas measures directed against *A. punctipennis*, Say, which occurs throughout the year, and *A. crucians*, Wied., which is most prevalent in late winter and early spring, had little effect on the incidence of the disease.

The results of the work described indicate that in the southern United States remedial measures should be concentrated against *A. quadrimaculatus*, which shows a definite seasonal prevalence (June–October), and that the control of this species is feasible even over large areas.

STUART (E.) & STOVER (N. M.). **Eradication of Salt Marsh Mosquitoes.**—*California State Bd. Health, Wkly. Bull.*, v, no. 44, pp. 173–175. Sacramento, Cal., 11th December 1926.

An account is given of the measures employed in mosquito control work in the salt marsh area of San Francisco Bay ; the operations are carried out over more than 400 square miles of land by district organisations obtaining their funds by local taxation. The mosquitos chiefly concerned are *Aëdes dorsalis*, Mg., and *A. squamiger*, Coq., both of which breed in brackish water and have a long range of flight ; they have been found inland at a distance of 15 miles from the nearest breeding grounds. On land that is open to the tidal flow it is merely necessary to cut ditches to give the tide access to hollows that retain water, in order to check breeding, but on reclaimed land the work is much more complicated and necessitates the installation of tide gates and the maintenance and oiling of drainage canals. Shrinkage and settlement occur on reclaimed land, and produce extensive cracks that hold water and are suitable for mosquito breeding ; such land has to be ploughed, as oiling it is very costly and difficult. Pumping also is sometimes necessary on reclaimed land that has sunk, in order to remove water from the drainage canals.

FAUST (E. C.). **An Enquiry into the Prevalence of Malaria in China.**—*China Med. Jl.*, xl, no. 10, pp. 937–956, 4 figs., 18 refs. Shanghai, October 1926.

Early records of malaria in China indicate that for several decades there has been heavy endemicity and epidemicity of malaria of the

three known types in the Yangtsze Valley and the more southern parts of China, while in the north the disease has been much less prevalent and much more benign in character, with only occasional epidemics due to unusual climatic conditions, such as floods. It is still the commonest disease in the country, and the most serious cause of ill health among Europeans in the East. The Research Committee of the China Medical Missionary Association has therefore undertaken the present enquiry, which has of necessity consisted largely of questionnaires sent out to all the hospitals in the country. The distribution of malaria in China is shown in a map, and the salient points of malaria incidence are discussed. The disease is a serious problem in the Yangtsze Valley, the south-east coastal provinces and the regions of the southern boundary adjacent to Tonkin and Burma. There is also a focus of the disease in the Amur basin, which is isolated from the other centres of infection. All of these endemic centres serve as reservoir localities from which the disease is disseminated, particularly when large bodies of troops have been moved about, as in recent years. The prevalence of the three types of malaria in various parts of China is discussed, and, in view of the fact that blackwater fever commonly accompanies malaria in tropical countries, the records of that disease also are briefly reviewed. Inspection of hospital reports of the last 50 years shows that there has been no material change in the amount or distribution of malaria as a whole during that period, and it is evident that, so long as the known malarious areas remain as reservoirs of infection, attempts to exterminate the disease from the ports and trading centres will only be temporarily successful and will not touch the real problem.

The species of *Anopheles* known in China and adjacent territory, of which the distribution is shown in a map, are *A. hyrcanus* var. *sinensis*, Wied.; *A. hyrcanus* var. *sineroides*, Yamada; *A. hyrcanus* var. *nigerrimus*, Giles; *A. gigas*, Giles (*edwardsi*, Yamada?); *A. barbirostris*, Wulp; *A. maculipennis*, Meig.; *A. lindesayi*, var. *japonicus*, Yamada; *A. punctibasis*, Edw.; *A. subpictus*, Theo.; *A. aconitus*, Dön. (*albirostris*, Theo.); *A. ludlowi*, Theo. (*hatorii*, Koidz.); *A. tessellatus*, Theo. (*thorntoni*, Ludlow); *A. listoni*, List. (?); *A. minimus*, Theo. (*christophersi*, Theo.); *A. superpictus*, Grassi; *A. mastersi*, Skuse; *A. pattoni*, Christophers; *A. jeyporiensis*, James; *A. jeyporiensis* var. *candidiensis*, Koidz.; *A. willmori*, James (*hanabusai*, Yamada); *A. fuliginosus*, Giles; *A. punctulatus*, Theo.; *A. maculatus*, Theo.; *A. stephensi*, List.; *A. karwari*, James; *A. philippinensis*, Ludl.; *A. jamesi*, Theo.; *A. maculipalpis*, Giles; and *A. kochi*, Dön. The dominant Anopheline in China is undoubtedly *A. hyrcanus* var. *sinensis*; though there is at present no evidence that this is the predominant malaria carrier in China proper, it has been shown capable of being the definite host of all three species of malaria *Plasmodium* in Formosa, where it is the important carrier of benign tertian malaria. The occurrence of *A. maculipennis* is too far north for this species to be considered of importance as a carrier in the regions of heavy endemicity in China except in a few places. With the exception of *A. hyrcanus* var. *sinensis*, all the Anophelines found in South China are peculiarly oriental in type, and are known as malaria carriers elsewhere. It is generally considered in China that rice-fields offer ideal mosquito-breeding grounds, but the author points out that this does not necessarily apply to Anophelines, and, in fact, it seems probable from collections that the dominant mosquito of the rice-

fields is a Culicine and not an Anopheline. The breeding-places of Anophelines in China are essentially unknown.

The very definite bearing that rainfall and temperature have on the endemicity and epidemicity of malaria in China is discussed. Without knowledge of the species of *Anopheles* responsible for malaria in a particular locality or information regarding their breeding-places, little can be done to reduce the Anopheline fauna. It is suggested that effective screening, and probably also the prophylactic use of quinine, would do much to limit the incidence of malaria in the human population. It is thought that in South China the climate in winter is sufficiently mild to provide a certain amount of infection from mosquitos during that season.

LEE (C. U.). **Filariasis Investigations in the Province of Kiang Su, China.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 4, pp. 279–287, 1 pl., 2 figs., 8 refs. London, 25th November 1926.

It has been stated that filariasis in Kiang Su is mainly confined to that part of the province south of the Yangtsze, but the author has found that the incidence of the disease in the northern part of the province is high, while it appears to be rare south of the river. Filarial larvae at different stages of development, almost certainly those of *Filaria bancrofti*, were present in the thoracic muscles of a fairly large proportion of individuals of *Culex pipiens*, L., taken in houses where there was filariasis. No other species of mosquito was found to be infected, and *C. fatigans*, Wied., which is usually considered to be the vector of filariasis in China, was not taken. *C. pipiens* has not hitherto been definitely incriminated as a host of *F. bancrofti*, for although Le Chuiton claims to have traced its development in this species in Cochin China [*R.A.E.*, B, xii, 126], it is most probable that the mosquito with which his experiments were carried out was *C. fatigans*, as *C. pipiens* is not known to occur in Cochin China.

Under present conditions in China mosquito control measures such as drainage and the introduction of modern methods of sewage disposal are almost impossible, but the use of mosquito nets in houses that are not properly screened should do much in reducing filarial infection. Suggested prophylactic measures for use by hospitals and other institutions in heavily infected areas are outlined.

BOREL (M.). **Résultats d'une enquête épidémiologique et entomologique à la plantation de Gia-Nhan (Cochinchine).**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 677–680. Paris, 1926.

In the locality under consideration malaria is very prevalent, the predominating *Plasmodium* being *P. vivax* ; *P. praecox* was occasionally found, while *P. malariae* only rarely occurred and then in association with one of the others. A survey of possible breeding-places of mosquitos showed that *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön., a species that often occurs even where malaria is not prevalent, was wide-spread. *A.* (*Neocellia*) *maculatus*, Theo., which was found breeding near houses, is probably the vector of malaria in the district.

PARROT (L.) & DONATIEN (A.). **Infection naturelle et infection expérimentale de** *Phlebotomus papatasi* **(Scop.) par le parasite du bouton d'Orient.** —*Bull. Soc. Path. exot.*, xix, no. 8, pp. 694–696, 1 ref. Paris, 1926.

Large numbers of flagellates, morphologically identical with cultural forms of *Leishmania tropica*, have been isolated from the stomach of an individual of *Phlebotomus papatasii*, Scop., taken in a hospital at Biskra, where no case of oriental sore existed.

A new method of inoculating mice with the virus of oriental sore is described. When *P. papatasii* was fed on mice thus infected, flagellates morphologically identical with the cultural forms of *L. tropica* were found in 17 out of 72 individuals; the organisms are restricted to the stomach, extending from the oesophageal valve to the beginning of the malpighian tubes and being particularly abundant in the anterior portion of the stomach, where some become attached to the epithelium by means of the flagellum. The flagellates are still present 95 hours after feeding, when digestion has already been completed, and have also been found alive 12 hours after the death of the sandfly.

THIROUX (A.). **Au sujet de la prophylaxie de la Maladie du sommeil.**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 701–702. Paris, 1926.

The use of aromatic oils in the prevention of attack by biting flies is very briefly reviewed, with particular reference to cajeput oil extracted from *Melaleuca viridiflora*. A letter from Dr. Varneau is quoted showing the value of this oil as a protection against *Glossina* in the Belgian Congo.

BOREL (M.). **Au sujet de l'action empêchante de la couleur blanche sur la ponte des moustiques, dans les jarres indigènes blanchies à la chaux.**—*Bull. Soc. Path. exot.*, xix, no. 8, p. 702. Paris, 1926.

Further observations in Indo-China on the repellent action of lime to ovipositing mosquitos [*R.A.E.*, B, xiv, 46] have shown that when mixed with water it does not reduce the microscopical algae necessary for the nutrition of the larvae, so that the inhibiting factor is entirely the white colour of the containers coated with it. As this gradually darkens, eggs are again laid in the containers so that they should be limed at least once a month.

BOREL (M.). **Note sur les gîtes de** *Neocellia maculata* **en Cochinchine et dans le Sud-Annam.**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 703–704. Paris, 1926.

In view of existing opinion that the larvae of *Anopheles* (*Neocellia*) *maculatus*, Theo., are able to resist strong currents [*R.A.E.*, B, ix, 134] the author points out that although they may resist the current or even attach themselves to any suitable object in the stream for a time, they are eventually carried away. It is only in the calm pockets formed at the side of the stream that they are able to hang on to pieces of grass, stones, etc. In Cochin China *A. maculatus* was abundant in unshaded water where the current was slowed down by thick, low vegetation. Wherever such vegetation was removed the increased current swept the larvae away.

Theiler (A.) & du Toit (P. J.). **La transmission des maladies, dont les tiques sont les vecteurs, par l'injection intrajugulaire d'une émulsion de l'hôte intermédiare.**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 725–737. Paris, 1926.

The experiments described [which were carried out in South Africa] show that the *Rickettsia* of heartwater (*R. ruminantium*) may be transmitted by intrajugular inoculation of an emulsion made from infected nymphs of *Amblyomma hebraeum*, Koch. The ticks were fed as larvae on infected cattle, and some were fed again as nymphs on uninfected cattle while others were not. In two cases out of three those fed on cattle transmitted the disease to them. An emulsion made from the infected nymphs was injected intravenously into sheep, infection resulting in four cases with nymphs that had been fed and in one with those that had not. Feeding apparently enhances the virulence of the organism.

Similar experiments were made with *Rhipicephalus appendiculatus*, Neum., transmitting *Theileria parva*, the causal organism of African coast fever. Ticks were fed as larvae and as nymphs on infected cattle, some of the resulting nymphs and adults respectively were fed on uninfected cattle and transmitted the disease to them. Intravenous injections of an emulsion of the infected nymphs and adults also proved infective to cattle provided that the ticks had been feeding for 72–120 hours. Unfed individuals or those feeding less than 72 hours did not produce the disease when inoculated.

Broudin (—) et al. **Contribution à l'étude du surra d'Indochine.**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 746–761, 4 charts. Paris, 1926.

An outbreak of surra due to *T[rypanosoma] annamense* is described from Indo-China. The clinical aspect of the disease is dealt with at length, and experiments with laboratory animals are described in detail. The vectors of the disease are probably flies of the genus *Stomoxys*, while buffalos are possibly a dangerous reservoir, as apparently the organism occurs in these animals without affecting them. They should be kept entirely separate from other animals, particularly horses, as the infection is always fatal in the latter. In cattle the course and virulence of the disease depends largely on general conditions, being most severe in cases of overwork and underfeeding.

Rossi (P.). **Contribution à l'étude du Phlébotome en Aunis.**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 705–709. Paris, 1926.

Brief notes are given on the habits of *Phlebotomus perniciosus*, Newst., as occurring in Aunis, on the western coast of France, where the sandflies play no part in the transmission of disease, though causing annoyance by their bites.

Nitzulescu (V.). **Sur la constitution du canal alimentaire chez les Phlébotomes.**—*Bull. Soc. Path. exot.*, xix, no. 8, pp. 709–714, 5 figs. Paris, 1926.

A study of the mouthparts of various sandflies, particularly *Phlebotomus papatasii*, Scop., and including *P. argentipes*, Ann. & Brun., has

shown them to be similar in all species examined. The findings, however, do not entirely agree with those of Christophers, Shortt, and Barraud [*R.A.E.*, B, xiv, 140] as regards the functions of some of the organs.

Nitzulescu (V.). **Contribution à l'étude de l'appareil buccal des Simulides.**—*C. R. Soc. Biol.*, xcv, no. 35, pp. 1336–1338, 2 figs., 1 ref. Paris, 3rd December 1926.

A study of the mouthparts of *Simulium* spp. has shown them to be very similar to those already described for *Phlebotomus* [see preceding paper].

Tejera (E.). **Les Blattes envisagées comme agents de dissémination de germes pathogènes.**—*C. R. Soc. Biol.*, xcv, no. 35, pp. 1382–1384. Paris, 3rd December 1926.

Owing to the habits of cockroaches they may obviously act as mechanical transmitters of various diseases, such as typhoid. The examination of the digestive tract of Venezuelan Blattids has revealed a rich fauna and flora, a list of which is given. *Herpetomonas* (*Leptomonas*) *blaberae*, sp. n., and *Entamoeba nana* were obtained from *Blabera* spp. ; the former could not be recovered from mice into which it was inoculated. Cockroaches fed on faeces containing encysted *Lamblia* contained cysts after 24 hours. The intestinal contents of cockroaches fed on pig faeces containing *Balantidium* caused ulceration of the colon in a monkey (*Cebus capuchinus*). Other pathogenic organisms recovered from cockroaches that had ingested infected material are the bacilli of dysentery, leprosy and tuberculosis.

In a note by Bacigalupo it is stated that eggs of *Hymenolepis nana* and cysts of *Giardia intestinalis* have been recovered from the faeces of cockroaches fed on infected material, the same observations having also been made in the case of *Tenebrio molitor* in the larval stage.

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). The Comparative Anatomy of the Male Genitalia of Fleas.** [*In Russian.*]—*Rev. russe Ent.*, xx, pp. 5–15, 7 figs., 10 refs. [Leningrad] 1926. (With a Summary in German.)

The contents of this paper are indicated by its title. The fleas dealt with are : *Ctenocephalus canis*, Curtis, *C. felis*, Bch., *Pulex irritans*, L., *Leptopsylla pectiniceps*, Wagn., *Ctenophthalmus breviatus*, Wagn. & Ioff, and *Ceratophyllus tesquorum*, Wagn.

Morison (J.). **Transmission of Plague by Fleas.**—*Rept. Haffkine Inst., 1925*, pp. 10–11. Bombay, 1926.

Investigation into the transmission of plague by the fleas, *Xenopsylla cheopis*, Roths., and *X. astia*, Roths., is being continued. In order to identify the species the flea is dropped into the wide end of a Wright's pipette and blown into the narrow stem head downwards and thus remains fixed in a position suitable for microscopic examination ; afterwards it can be blown back into a test tube uninjured and ready for use. Some of the difficulties of accurate determination are discussed. It was found that lightly chloroforming a rat and brushing it only

removed about 60 per cent. of the fleas, but that quick immersion in petrol was successful in completely ridding the rat of fleas without injury to it. From September to December no successful plague transmissions were made, but it is possible that the season had something to do with the failures, as Bombay is usually free from plague during these months.

[Golov (D. A.) & Ioff (I. G.).] **Голов (Д. А) и Иофф (И. Г.). Fleas of Ground Squirrels as Carriers of Plague Infection during the Winter.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, v, no. 4, pp. 239–248. Saratov, 1926. (With a Summary in French, pp. 329–331.)

The experiments described, which were confirmed by observations in nature, indicate that the fleas occurring on ground squirrels [*Citellus*] in the Lower Volga region can remain in the burrows of these animals throughout the winter, even in the absence of the host. They remain active and are able to feed on the hibernating animals, but in their absence may withstand starvation for at least 10 months. Plague infection in the living fleas retains its virulence for 206 days and possibly longer. The fleas may thus carry the disease over from one epidemic season to another, and to control plague it would be necessary to exterminate them as well as the rodents themselves.

Ceratophyllus tesquorum, Wagn., *Neopsylla setosa*, Wagn., and *Ctenophthalmus breviatus*, Wagn. & Ioff, were used in these experiments, which were not extensive enough to show any differences in the three species.

[Yatzenko (F. I.).] **Яценко (Ф. И.). On the Choice of Hibernating Places by the Malaria Mosquito, *Anopheles maculipennis*, Meig., in the Ukraine.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, v, no. 4, pp. 277–278. Saratov, 1926. (With a Summary in German, p. 334.)

As a result of observations in the Ukraine it has been found that *Anopheles maculipennis*, Mg., usually hibernates in damp, dark buildings, with moderate temperatures. Of the mosquitos found in the region 41·7 per cent. occurred in cowsheds, 36·6 per cent. in stables, and only 7·5 per cent. in dwellings.

[Yatzenko (F. I.).] **Яценко (Ф. И.). The relative Value of Crude Oil and Kerosene for the Control of the Larvae of *Anopheles maculipennis*, Meig.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, v, no. 4, pp. 279–283. Saratov, 1926. (With a Summary in German, p. 334.]

Crude oil can be effectively used against mosquito larvae in waters that have very little surface vegetation, but where such vegetation is abundant kerosene should be used, as otherwise large areas may be left uncovered by the oil film. The application of oil to overgrown areas should be done by spraying, whereas on waters free from vegetation it may be poured from buckets. In the town of Kharkov 10–30 cc. of kerosene or double that amount of crude oil to a square metre was sufficient to kill the larvae of *Anopheles maculipennis*, Mg., but further south, according to the rate of evaporation of the oil, it may be necessary to use as much as 60 cc. of kerosene or 90 cc. of crude oil. The applications need not be made at intervals of less than three weeks.

Walton (C. L.) & Wright (W. R.). **Hydrogen-ion Concentration and the Distribution of** *Limnaea truncatula* **and** *L. peregra*, **with a Note bearing on Mosquitoes.**—*Parasitology*, xviii, no. 4, pp. 363–367, 5 refs. Cambridge, December 1926.

In a previous study of the effect of hydrogen-ion concentration of water on mosquito larvae [*R.A.E.*, B, x, 25] the indications were that tree-hole breeders required an acid range of pH, and surface-water breeders required an alkaline range. The authors, repeating the experiments, did not find these observations confirmed. Larvae of *Aëdes detritus*, placed in water adjusted, by the addition of acetic acid, to a pH of about 4·2, remained alive in the water for a considerable period, until it dried up. Larvae of *Culex pipiens* placed in water at pH 4, 7·5 and 9+, and larvae of *Anopheles maculipennis* at 4+, 7·5 and 10, showed very similar results.

Mumford (E. P.). **Three new Cases of Myiasis in Man in the North of England, with a Survey of earlier Observations by other Authors.** —*Parasitology*, xviii, no. 4, pp. 375–383, 20 refs. Cambridge, December 1926.

Cases of myiasis are apparently of quite exceptional occurrence in the British Isles. This paper deals with three hitherto unrecorded cases, two of urethral and one of intestinal myiasis. The former, which occurred in infants, are considered to have been due to larvae of *Musca domestica* and *Fannia canicularis*, and the latter to Syrphid larvae. All the identifications were from the immature stages.

Ross (I. C.). **An Experimental Study of Tick Paralysis in Australia.** *Parasitology*, xviii, no. 4, pp. 410–429, 2 figs., 48 refs. Cambridge, December 1926.

The following is taken from the author's summary of this paper: Tick paralysis occurs in man, the dog, and other domesticated animals on the East Coast of Australia. So far as is known, the disease in Australia is only conveyed by the mature female of *Ixodes holocyclus*. A similar disease, induced by females of other species of ticks, has been observed in South Africa, Canada and Crete. A single tick may cause fatal paralysis in man and the dog in Australia, the death-rate in dogs being very high. The main symptoms of tick paralysis in Australia do not differ materially from those observed in other countries. They begin with loss of co-ordination commencing in the hind legs in dogs, the fore legs, head and neck becoming subsequently affected. Death in all cases appears to be due to respiratory paralysis. The onset of symptoms has not been observed to occur in less than 5 days from the time the tick or ticks have attached themselves to a dog. Some of the ticks do not produce paralysis and others do; but this does not depend on the time that has elapsed between the tick having moulted and its attacking the dog. Paralysis has never been seen to occur when ticks were removed from dogs before the time when symptoms usually appear. It is impossible to transmit the disease by the inoculation of blood, cerebrospinal fluid or nervous tissue from affected animals, or by the injection

of the body contents of ticks removed from affected animals. The examination of the fluids and organs of affected animals has failed to reveal the presence of pathogenic organisms. It is considered that the causal factor is a tick-derived toxin secreted by the salivary glands. During engorgement the salivary glands develop greatly, pouring out a maximum amount of secretion during the two days before the female tick drops. An emulsion of salivary glands of *I. holocyclus* proved to be toxic, for when injected into a dog it caused fever, vomiting, etc. The salivary secretion contains anticoagulins, and as has been found for anticoagulins, individual ticks may vary in toxicity. The period which elapses between the attachment of a tick to the host and the first signs of an attack of tick paralysis cannot be regarded in the light of an incubation period ; it is dependent on the rate and stage of the tick's engorgement. There is some evidence that immunity from the disease may be acquired after recovering from previous attacks. There is no evidence of season having an influence on tick paralysis ; it was induced experimentally in both winter (June–August) and summer (November–December) in Sydney.

CAMERON (A. E.). **The Occurrence of** *Cuterebra* **(Diptera, Oestridae) in western Canada.**—*Parasitology*, xviii, no. 4, pp. 430–435, 1 fig., 8 refs. Cambridge, December 1926.

Species of the genus *Cuterebra* have been collected at various times in western Canada, the records including *C. emasculator*, Fitch, from a chipmunk (*Tamias striatus lysteri*) in an unknown locality, and *C. fasciata*, Swenk, *C. americana* var. *polita*, Coq., *C. similis*, Johnson, *C. tenebrosa*, Coq., and *C. grisea*, Coq., all from British Columbia. The last-named appears to be the prevailing species in western Canada. The adults are not often seen, as they prefer dark situations such as outbuildings and the burrows of rodents. They are on the wing from June to September and probably do not go far from the rodents' haunts. They have been reared from a gopher, a vole and a rat. The presence of one or two larvae does not seem to inconvenience the host seriously, but a rat infested with 17 larvae was emaciated. Though small rodents are the usual hosts, the presence of the parasites in dogs and cats is not unknown, and details of such infestations are recorded. In July 1918, 5 Cuterebrid larvae were extracted from beneath the skin of a brown rat, *Mus* (*Rattus*) *norvegicus*, in Saskatchewan, and as this rat, since its first reported occurrence in the Province, has gradually spread to the west and north until it is now established over about 16,000 square miles, and is still spreading, it will be of interest to observe what the relationship of *Cuterebra* to its increase may be.

A description of the larvae is appended.

PINTO (C.). **Hypopygio dos Triatomideos (Hemipteros-Heteropteros hematophagos) e do genero** *Apiomerus*. [The Hypopygium of Triatomids and of the genus *Apiomerus*.]—*Bol. biologico*, fasc. 2, pp. 27–29, 4 pls. S. Paulo, 15th October 1926.

Illustrated descriptions are given of the male hypopygia of *Triatoma rubrofasciata*, DeGeer, *T. lutzi*, Neiva & Pinto, *T. brasiliensis*, Neiva, *T. infestans*, Klug, *T. sordida*, Stål, *Rhodnius brumpti*, Pinto, and an insectivorous Reduviid of the genus *Apiomerus*.

PITTALUGA (G.). **Epidemiological Study of Leishmaniasis in Spain.**— *Jl. Trop. Med. & Hyg.*, xxix, no. 23, pp. 387–398, 1 map, 2 pp. refs. London, 1st December 1926.

This report is compiled from the work of many authors and also personal observations. The history, distribution and general epidemiology of leishmaniasis visceralis (infantile kala-azar) due to *Leishmania infantum*, as occurring in Spain are discussed, and a critical review is given of the different theories on the method of transmission. For various reasons the author disagrees with the theory of transmission by way of the digestive tract. In the case of unweaned babies it is difficult to imagine an infection by resistant forms of *Leishmania* coming in contact with the infant's mouth. Transmission by inoculation through intestinal worms is unlikely in Spain, as the small children do not harbour them, and the older children, though harbouring various intestinal worms, rarely show symptoms of leishmaniasis.

The author does not consider that dogs are a reservoir of infantile kala-azar, although the casual organisms of this disease and of canine leishmaniasis are probably identical. The transmitting agent of the latter could not be a parasite so constantly associated with the life of the dog as *Ctenocephalus canis*, Curt., or the disease would be much commoner in this animal. Moreover, while the proportion of infected dogs in certain centres of human leishmaniasis is much higher than amongst dogs taken at random, there are houses and small towns where infantile kala-azar occurs and where dogs do not harbour the virus, and the infection of children is not always related to the presence of dogs. Children and dogs probably become infested by the same vector, which is one less closely associated with one or the other than a flea. It is possible that the infantile kala-azar might be transmitted by *Pulex irritans*, L., but this would also involve the conception that the dog is not the reservoir of the virus of man.

The study of the distribution of the disease renders it extremely unlikely that it is transmitted by *Cimex lectularius*, L.

The recent implication of sandflies in the transmission of kala-azar in India has led to a study of *Phlebotomus* in Spain. The species recorded are *P. papatasii*, Scop., *P. perniciosus*, Newst., *P. minutus*, Rond., and *P. sergenti*, Parr. Sandflies are abundant in Spain all through the summer in the rural or semi-rural houses of certain localities, and are even found in garden districts of towns. Their occurrence is strikingly coincident with the distribution of infantile kala-azar. Though the gecko (*Platydactylus mauritanicus*), which is also abundant in the same localities, is said by some authors to be the reservoir of infantile kala-azar, observations in Spain have not confirmed this theory. Examinations of *P. papatasii* and *P. minutus* have also so far given negative results, but further, more extensive observations along these lines should be made.

CONNAL (A.). **Annual Report of the Medical Research Institute, 1925.**— *Nigeria* : *Ann. Med. & Sanit. Rept. 1925*, Appx. A, pp. 1–37, 1 graph. Lagos, 1926.

The plague outbreak in Lagos [*R.A.E.*, B, xiv, 174] did not spread much into the surrounding country, and the incidence was lower in 1925. The rats and fleas observed are noticed below [*R.A.E.*, B, xv, 39]. Guineapigs let loose in rooms of native houses that had contained

plague cases and had been fumigated 1–2 days previously were attacked by fleas in a short time, while in one case where two guineapigs were let loose in a room that had been disinfected by spraying with kerosene and cyllin they were not attacked by fleas. These results show the inefficiency of disinfection with gases and the apparent efficacy of spraying with an oily compound, in the average native house in Lagos.

A study of the markings of *Aëdes argenteus*, Poir., was begun, and wide variations were found to exist, especially on the legs. Cross-breeding experiments with *A. luteocephalus*, Newst., and *A. argenteus* and *A. longipalpis*, Grünb., gave negative results.

The results of dissections of a number of biting insects for parasitic organisms are tabulated. A list of mosquitos identified from several districts is given, also a table showing the types of breeding-places from which over six thousand collections of mosquito larvae were made, with the number of collections made of each of the 17 species represented in each type of breeding-place in each month of the year. The most abundant species were *A. argenteus*, which occurred in 3,700 collections, and *Culex* (*Culiciomyia*) *nebulosus*, Theo., in 2,059, while *Anopheles gambiae*, Giles (*costalis*, Theo.) occurred in 443 collections, *C. fatigans*, Wied., in 196, *C. duttoni*, Theo., in 86, *C. decens*, Theo., in 46, *Aëdes irritans*, Theo., in 58, and *A. luteocephalus* in 55. Most of the above species were taken in a large variety of breeding-places at various times of the year, but *Culex insignis*, Cart., and *Uranotaenia annulata*, Theo., which occurred 13 and 12 times, respectively, were only found in crabholes, and, with the exception of one collection of the former in June, only in November and December; *A. luteocephalus* occurred 39 times in collections from trees from May to July.

Lloyd (Ll.). **Report of the Tsetse Investigations, 1925.**—*Nigeria* : *Ann. Med. & Sanit. Rept. 1925*, Appx. E, pp. 99–106. Lagos, 1926.

During 1925 the experimental work of the Tsetse-fly Investigation in the Northern Provinces of Nigeria [*R.A.E.*, B, xi, 117; xii, 160] followed three principal lines, the exclusion of game from a tsetse-fly focus, controlled grass-burning, and clearing. An area comprising half a square mile of forest, including a pool about 1 mile long, was enclosed by a fence 3 miles long composed of 4-inch mesh wire netting 5 ft. 6 in. high, with 3 in. buried in the ground, attached to posts 5 ft. apart. Considerable difficulty was experienced in excluding game from the fenced area. The effect of the absence of game on *Glossina tachinoides*, Westw., within the enclosure was to reduce the density (number of flies caught per net per hour) from about 50 to 21–24 and to increase the percentage of human blood ingested by the flies from 1·3 to 2·8 per cent. of the total, while the percentage of human blood among all mammal bloods of which the size could be recognised increased from 24 to 34; the percentage of non-mammalian blood (chiefly reptilian) in the diet remained the same at 53. There was no real evidence of mal-nutrition, the percentage of well-nourished flies being 73 as compared with 75 in the neighbouring fly area, so that a rise in the percentage of flies apparently starving from 4 to 10 was not of much importance. There was no notable change in the infectivity to domestic stock, but a slight increase in the percentage of female flies.

The numbers of *G. morsitans*, Westw., were also reduced, the density in the latter part of the first dry season after closing the fence being 11 as against 30 in a similar area used as a control, and 23 as

against 41 for the whole of the second dry season. The proportion of non-mammalian blood (all avian so far as could be determined) rose from 3·4 to 9·4 per cent. of all the blood taken, while the percentage of human blood rose from 1·4 to 2·3, being from 12·4 to 17·1 per cent. of all the mammal bloods taken. In the first four months after the closing of the fence the percentage of starving flies was 14·2, as against 6 in the control area, while in the second dry season it was 33·9, as against 8·8. The proportion of females caught in the dry season was uniformly higher in the fenced area, being generally about double, and in two months reached the high figure of 30 per cent. The infectivity of the flies to stock within the fence was rather higher than previously, and distinctly higher in the dry season than in the control area. It proved comparatively easy to reduce the population of *G. morsitans*, temporarily, almost to nothing in the fenced area in the middle of the dry season, by catching the flies, but the recovery in numbers was too rapid to be accounted for by breeding there. For this and other reasons it is concluded that *G. morsitans* in outlying parts of its area that have been called secondary foci is constantly reinforced, even in the dry season, by invaders from the primary foci. The invaders are hungry flies venturing out in search of food, in addition to those brought by animals or man. This accounts for the apparent anomaly that occurred, that the amount of blood taken did not fall in proportion to the extraordinary state of starvation produced. Much of the blood must have been taken outside the fence, for if it had been obtained from the small creatures inside it would have been a regular supply and there would have been normal nourishment.

The experiment shows that if there is no game a state of starvation is quickly produced in *G. morsitans*, and that although human blood may be taken more frequently it does not make up the deficiency—the fence was in contact with much-used paths and a gang of ten men was kept within it for about 5 hours each day. *G. morsitans* is, however, unable to feed economically on man, and there is little doubt that it would rapidly disappear from areas in which the wild Ungulates were destroyed. Game destruction would not, however, necessarily be beneficial, as, in Nigeria, wherever *G. morsitans* occurs either *G. tachinoides* or *G. palpalis*, R.-D., occurs also, and neither of these, although reduced in numbers by game destruction, shows signs of being exterminated thereby; moreover, they can feed more economically on man than can *G. morsitans*. It is thought, however, that any tendency to increase game in Northern Nigeria, unless in limited reserves, would lead to the spread of *G. morsitans*.

Grass-burning on an area of 20 square miles was postponed until February, some two months after the normal time. The area acted as a sanctuary for game, and *G. morsitans* was well fed up to the time of burning, but obtained little food in the succeeding month; this deprivation was not, however, of sufficient duration to produce mal-nutrition. Work on clearing a broad belt right through the tsetse-fly area in which the investigation camp is situated, and on clearing badly-infested parts of forest bordering on main roads [*R.A.E.*, B, xiv, 69] has been begun, the results so far obtained being excellent. Clearing of thorn thickets is sufficient to keep *G. tachinoides* away, and it is hoped that it will also destroy *G. morsitans*, which is almost confined to the thicket edges for two or three months of the year, and breeds mainly in this type of bush, so that the cutting down of the deciduous savannah forest, except as an immediate precaution along the main road, may be unnecessary.

YOUNG (W. A.). **Third Report on Tsetse Fly Conditions in the Gold Coast.**—6 pp. Accra, 1st September 1925. [Recd. from the Colonial Office, 13th December 1926.]

These investigations were undertaken in August, and compared with the seasons March and December [*R.A.E.*, B, xiii, 161] the numbers of tsetse-flies had increased tremendously. Foliage was abundant, the grass varied in height from two to six feet, big game was undoubtedly plentiful and the human population was scarce. The local distribution of the flies is described, the species recorded being : *Glossina palpalis*, R.-D., *G. tachinoides*, Westw., *G. morsitans submorsitans*, Newst., *G. longipalpis*, Wied., *G. fusca*, Wlk., *G. pallicera*, Big., *G. medicorum*, Aust., and one individual of *G. morsitans*, Westw.

It is suggested that one of the factors restricting the breeding period of the flies is the rise and fall of the Volta. Though the breeding may take place during the greater part of the year, conditions along the river banks would appear to be suitable for pupation only from about October to January when the river is falling and there is a combination of dry sand and shade. Apparently the flies bite at any hour, more especially if the grass or plants on which they are resting are disturbed. Of 100 *G. morsitans* dissected, 16 were infected completely with trypanosomes of the *Trypanosoma congolense* group and 12 with *T. vivax*.

JAMOT (E.). **La maladie du sommeil dans le nord du Cameroun.**—*Ann. Méd. & Pharm. colon.*, xxiv, no. 3, pp. 318–349, 1 map. Paris, July–September 1926.

Since the discovery of a fresh centre of infection of sleeping sickness in the extreme north of Kamerun [*R.A.E.*, B, xi, 101], an inspection of the whole of the infected region has been made with a view to determining the limits of its occurrence and to organise measures for its control. The correlation between the presence of *Glossina tachinoides* and the incidence of the disease has been corroborated by further investigation, this being the only species found in the most heavily infected districts, and, since the report on tsetse-fly investigations in Nigeria in 1923 [*R.A.E.*, B, xi, 117], the parallel between the geographical distribution of the fly and of the disease has been found to be even closer than was thought. While it would be impossible to attack all the haunts of the fly, it is at least feasible to destroy without great effort the thin forest belts that harbour it in the proximity of villages, fords, and watering places of animals. The Arab inhabitants are careful of the health of their animals and could probably be induced to clear a few hundred yards of the ground around the watering places and to choose pastures where there is no brushwood and, consequently, no tsetse. In one village where many boats collected in the river for trading purposes, where tsetse was abundant on the banks of the river and where 35 per cent. of the villagers were infected, the headman of the village was persuaded to clear both banks of the river for a little over half a mile, the river being about 200 feet wide. This resulted in the rapid disappearance of all tsetse-flies, in spite of the retention of large, shady trees. This disproves the theory that cleared spaces shaded by high trees are favourable for the breeding of *G. tachinoides*. What has been done in this village should be repeated throughout the villages of the infected region, which are enumerated and shown on a map.

Brau (—). **Lutte contre la maladie du sommeil en Afrique occidentale française.**—*Ann. Méd. & Pharm. colon.*, xxiv, no. 3, pp. 383–394, 12 refs. Paris, July–September 1926.

The situation with regard to sleeping sickness in various regions of French West Africa is reviewed, and the improvement in conditions there and in the general health of the inhabitants, due largely to the work of the Health Service, is described.

Lounsbury (C. P.). [**Report of the Chief, Division of Entomology, 1925–26.**]—*Farming in S. Africa*, i, no. 9, pp. 334–338, 1 fig. Pretoria, December 1926.

This report includes a section on tsetse-fly investigations. It appears from studies made during the past five years in Zululand that the tsetse-fly [*Glossina pallidipes*] feeds entirely on blood and locates its prey by sight alone. It may wander to objects some distance away from the bush and cross hundreds of yards of open grassland separating one mass from another. The female has not been known to produce more than ten larvae altogether, depositing them one at a time at intervals of many days, and to have her full complement must be fertilised more than once. The larvae at once enter the soil to pupate, preferring loose, well-drained soil partly shaded. They appear to be unable to develop fully where temperature conditions are not suitable.

It is suggested that the best way to control the fly in Zululand would be to diminish considerably the larger wild animals, thus decreasing the food supply and consequently the chances of survival and propagation.

Thomson (J. G.) & Robertson (A.). **Variations in the Virulence and in the Morphology of certain Laboratory Strains of *Trypanosoma gambiense* and *Trypanosoma rhodesiense* isolated from Human Cases.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 24, pp. 403–410, 13 refs. London, 15th December 1926.

Experiments are described in which strains of the sleeping-sickness trypanosomes, *Trypanosoma gambiense* and *T. rhodesiense*, were passed from man to laboratory animals. Strains of *T. rhodesiense* rapidly increase in virulence by passage from rat to rat and soon became stabilised. *T. gambiense* is much more difficult to establish in rats, some strains rapidly becoming virulent while others lose virulence by passage from rat to rat. There may be much discrepancy in the virulence of different strains ; this is possibly due in part to differences in the length of time that they inhabited the human host, or to the effect of treatment undergone by the host. *T. gambiense* may exhibit a peculiar latency, similar to that observed in human cases as a result of drug treatment, the effect of which in both man and animal hosts is discussed. When either of the above trypanosomes is transferred mechanically from man to rats, it exhibits a well-marked polymorphism which, later, is lost. Up to a certain stage the polymorphic nature of the parasites can be made to return by transferring the strain from the usual host into a host of another species.

Maclean (G.). **History of an Outbreak of Rhodesian Sleeping Sickness in the Ufipa District of Tanganyika Territory with Short Notes on Cases and Treatment.**—*Ann. Trop. Med. & Parasit.*, xx, no. 4, pp. 329–339, 1 diagram. Liverpool, 17th December 1926.

The history of a recent outbreak of sleeping sickness in the Ufipa district of Tanganyika Territory is discussed, including the diagnosis and treatment of cases. The cause of the outbreak is unknown, though it is probably connected with the lowered vitality of the population due to various causes. The topography of the country is described. *Glossina morsitans*, Westw., was the only tsetse-fly found; it occurs practically throughout the forests towards the end of the rains and the beginning of the dry season (May–June), but is less abundant from about the middle of the dry season (August–September) to the beginning of the rains (November–December). Other biting flies included several species of *Tabanus*, *Haematopota*, and in some places *Chrysops*. Game is fairly abundant.

Connal (A.). **The Rodents of Lagos and their Ecto-parasites with Reference to Plague.**—*Ann. Trop. Med. & Parasit.*, xx, no. 4, pp. 341–353, 1 chart, 1 fig. Liverpool, 17th December 1926.

During a rat campaign in connection with plague in Lagos in 1924 and 1925 [*R.A.E.*, B, xv, 34] the rodents caught were rats (*Mus rattus* and *M. norvegicus*), mice (*M. musculus*), shrews (*Crocidura manni*), striped field rats (*Lemniscomys fasciatus*) and pouched rats (*Cricetomys gambianus*). The last two were not numerous and were not infected with plague. The ectoparasites collected from the first four species were *Xenopsylla cheopis*, Roths., *X. brasiliensis*, Baker, *Ctenocephalus canis*, Curtis, and *Laelaps echidninus*, Berl.

Though the number of infected rats increased during the last four months of 1925, there was no corresponding increase in the number of cases in man.

Adler (S.) & Theodor (O.). **The Identity of *Leishmania tropica* Wright, 1903, and *Herpetomonas papatasii* Adler, 1925.**—*Ann. Trop. Med. & Parasit.*, xx, no. 4, pp. 355–364, 2 pls., 18 refs. Liverpool, 17th December 1926.

In the experiments described three strains isolated from patients experimentally infected with *Herpetomonas* from naturally infected *Phlebotomus papatasii*, Scop. [*R.A.E.*, B, xiii, 176; xiv, 167] were compared by cross agglutinations with three strains from naturally acquired oriental sore. Serological tests prove that *Herpetomonas papatasii* is identical with *Leishmania tropica*. The technique is described.

It is considered almost certain that the development of *L. tropica* in *P. papatasii* is a biological one, with infective forms at the end of the cycle in the sandfly. These forms need not necessarily be present in an insect containing *Herpetomonas*, and this may explain some of the negative results obtained in experiments on animals.

The marked differences in the lesions produced in man by *L. tropica* depend entirely on factors present in the infected individual.

DOSTROWSKY (A.). **A Study of Cutaneous Leishmaniasis in Palestine.**—*Ann. Trop. Med. & Parasit.*, xx, no. 4, pp. 385–406, 3 pls., 1 fig., 1 map. Liverpool, 17th December 1926.

A number of cases of oriental sore from Palestine and other countries are described, from which it is concluded that the disease is more widely distributed in Palestine than was supposed.

The theory of transmission by biting insects is briefly discussed, the relation between the distribution of sandflies and the disease upholding the view that *Phlebotomus* is the natural vector.

ADLER (S.). **A Note on the Histopathology of a Case of Experimental Cutaneous Leishmaniasis.**—*Ann. Trop. Med. & Parasit.*, xx, no. 4, pp. 407–410, 1 pl. Liverpool, 17th December 1926.

In the case described *Herpetomonas* from a naturally infected sandfly, *Phlebotomus papatasii*, Scop., caught at Jericho, was inoculated into the forearm of a patient. Histologically the lesion produced was practically indistinguishable from tuberculosis. Four months after inoculation numerous Leishman-Donovan bodies were found, and cultures of *Leishmania tropica* were obtained from the lesion. The distance between the outer surface of the skin and the nearest point on the nodule was well out of reach of the piercing proboscis of *P. papatasii*, which may explain why feeding experiments made with this sandfly at a time when parasites were very numerous all gave negative results.

PARROT (L.). **A propos de *Phlebotomus caucasicus* et de *Phlebotomus sergenti*.**—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, no. 12, pp. 719–720. Leipzig, December 1926.

In a paper on sandflies in Russia [*R.A.E.*, B, xiv, 134] Popov includes Europe, Asia and Africa in the distribution of *Phlebotomus caucasicus*, Martz. In the literature this species is not mentioned from these regions except as a synonym of *P. sergenti*, Parr., and the author therefore considers that if Popov is correct in regarding *P. caucasicus* as distinct from *P. sergenti* [B, xiii, 167], the distribution of the former is limited to the Caucasus and Russian Turkestan.

RODHAIN (J.). **Nouvelles observations sur les Sarcoptides psoriques parasites de Roussettes africaines, au Congo.**—*Rev. zool. afr.*, xiv, no. 2, pp. 212–216, 1 fig., 1 ref. Brussels, 15th November 1926.

Since the author's record of the mites, *Nycteridocoptes pteropodi*, Rodh. & Ged., and *Teinocoptes epomophori*, Rodh., on the flying-foxes, *Micropteropus pusillus* and *Epomophorus wahlbergi haldemani*, at Boma, Lower Congo [*R.A.E.*, B, xi, 99], the latter parasite has been found several times on *Epomops franqueti* in another locality. Although natural infection of *Eidolon helvum* with *T. epomophori* was thought to be improbable [*loc. cit.*], individuals of this species have been found infested with both species of mite. Incidentally, infestation of *M. haldemani* with *N. pteropodi* occurred during experiments, and complete development on this flying-fox proved possible. The infestation eventually dies out, leaving the host as a rule little the worse for it.

PATTON (W. S.) & HINDLE (E.). **Reports from the Royal Society's Kala Azar Commission in China. No. 6—Notes on the Species of Sandflies (Genus *Phlebotomus*) of North China.**—*Proc. R. Soc.*, Ser. B, c, no. 705, pp. 405–412, 7 figs., 7 refs. London, December 1926.

Descriptions are given of the three species of sandflies found in North China. *Phlebotomus major* var. *chinensis*, Newst., is widely distributed, and in Peking, where kala-azar is comparatively rare, it is said to be very common in late May and June. Young and Hertig have found that the parasite of Chinese kala-azar develops in 85·3 per cent. of the females of this species fed on the blood of infected giant hamsters (*Cricetulus triton*), and since it appears that kala-azar is either very rare or not endemic south of the Yangtsze River, it is of some importance to determine the southern limit of the distribution of *P. major chinensis*. They also state that it seems to be single-brooded and is found chiefly during June and the early part of July. Two of the females caught by the authors laid eggs ; one batch proved sterile and from the other two larvae hatched in 9–10 days but died shortly afterwards.

A description is given of an unnamed variety of *P. sergenti*, Parrot, briefly described by Newstead in a paper already noticed [*R.A.E.*, B, ix, 43] ; it was recorded by Young and Hertig from Peking and Hsüchowfu (in the latter place it was common from the middle of June to the end of September). They conclude that it has two or more broods in the summer. They found flagellates in about 3 per cent. of the females fed on infected giant hamsters and striped hamsters [*Cricetulus griseus*].

A new variety is described of *P. perturbans*, de Meij. (as understood by authors, although the original description is so meagre that the identity of this species is not certain) ; it was found in Tsinan and at Taian, being common in the latter place during July and August. So far as could be ascertained it was biting man, although none of the insects caught could be induced to bite man or hamsters. Eggs from thirty females caught in August hatched in due course, but only two of the larvae pupated (on 22nd and 25th September respectively) and one female emerged on 5th October. This female refused to feed on a gecko. About 50 eggs were obtained from females caught at the end of August, and larvae started hatching on 5th September. One female, which emerged on 15th October, also refused to bite gecko or man. The larvae of this species seemed able to withstand a considerable amount of cold and dessication and yet remain quite active. They thrived on the faeces of rabbit and gecko, kept moist by standing the receptacle in a dish of water. Although the larvae in the experiments died towards the end of November, it seems probable that *Phlebotomus* hibernates in the North China in the larval stage.

The assumed difficulties attendant on the breeding and transportation of sandflies would appear to be exaggerated. Eggs and larvae of *P. argentipes*, Ann. & Brun., obtained from Calcutta on 30th July, were kept on board ship and supplied with food and moisture under the very unfavourable conditions of an ordinary ship's cabin during hot weather. The larvae pupated and the adults emerged 11–13 days later. The females laid eggs on moist plaster of Paris, and although these eggs could not be kept sufficiently moist, nor could any attention be given to the hatching larvae, eleven of these survived and two adults emerged on 10th October in the laboratory at Tsinan. Unfortunately they were both females and in the absence of males refused to feed, so that no

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brood could be reared. Thus there would probably be no great difficulty in transporting sandflies from one country to another if the original number of eggs and larvae was large enough.

PURVIS (G. B.). **East Coast Fever.**— *Vet. Rec.*, vi, no. 39, pp. 875–880, 1 fig., 7 refs. London, 25th September 1926.

African coast fever, both epizootic and enzootic, of cattle in Kenya Colony is discussed. The difference between this fever, which is caused by *Theileria parva*, and Mediterranean coast fever, caused by *T. dispar*, has been stated to be that the former is not transmissible by blood inoculation and that the immunity conferred by an attack of the disease is permanent. The author's observations have shown that the immunity is lost after an interval of non-exposure to the disease. This has been confirmed by the experiments of J. Walker, Chief Veterinary Research Officer.

Adult cattle from enzootic areas have a long-lasting degree of immunity. Natural immunisation depends on the presence of many infected ticks; if therefore, these ticks are removed in sufficient number, either by hand or dipping, etc., the cattle lose their immunity and may die on re-exposure to the disease. For this reason native labourers on European farms will not allow their cattle to be dipped in case they should die on return to the enzootic area in the Native Reserve. Any attempt to introduce compulsory dipping on European farms would result in the wholesale emigration of labour and the paralysis of the farming industry. Production of immunity naturally, with minimum loss, requires the certain infection of calves at a very early age, and if this is not brought about, infection in later life causes heavier mortality. Regular and well-conducted dipping may be efficient in dry countries or in dry seasons to protect cattle from re-infection, but it cannot be relied on during the wet seasons in Kenya Colony when the residual arsenic, on which its efficiency depends, may be washed off by the rain. The author considers that all immunity to African coast fever is acquired.

DONALDSON (A. W. H.). **Report on Relapsing Fever at Oadweina.**— *Somaliland Prot.: Ann. Med. & Sanit. Rept., 1925*, pp. 29–32. [London, 1926.]

In 1925 an epidemic of relapsing fever, apparently caused by *Spirochaeta duttoni*, occurred at Oadweina, Somaliland Protectorate, among the native population, but the mortality was very slight. Ticks believed to be *Ornithodorus moubata*, Murr., were found, and it is thought that they were probably the vectors of the disease, rather than bed-bugs [*Cimex*], which were very common in the more permanent buildings, as Arabians, who did not sleep on the ground like the natives, remained free from the disease. Either *O. moubata* may be endemic at Oadweina and the infection may only recently have been introduced, or the tick may have been introduced in mats from Hargeisa, which was almost the only place in Somaliland where relapsing fever occurred previously [*R.A.E.*, B, iii, 72, 150]. It is suggested that in order to prevent the further spread of the disease, the town of Oadweina should be moved as soon as possible, and radical measures, such as burning, should be adopted for the destruction of ticks on the site.

Fletcher (W.) & Lesslar (J. E.). **Tropical Typhus.**—*Ind. Med. Gaz.*, lxi, no. 11, pp. 529–531, 13 refs. Calcutta, November 1926.

The history of the disease known in various parts of the world as tropical typhus is briefly reviewed, and a similar disease occurring in the Malay States is described [*R.A.E.*, B, xiv, 175]. The disease is common and is not subject to seasonal variation. It generally attacks men who work with cattle or in the waste grass land where cattle graze, while town-dwellers and workers in the tin-mines are seldom infected. No lice [*Pediculus*] have been found on patients, and the authors' experience supports the hypothesis that the disease is transmitted by ticks or mites [*R.A.E.*, B, xiii, 66]. The authors consider it probable that, at least in Malaya, the vector spends a part of its existence on cattle and a part on rodents.

Sen (S. K.). **Experiments on the Transmission of Rinderpest by means of Insects.**—*Mem. Dept. Agric. India*, Ent. Ser., ix, no. 5, pp. 59–185, 1 pl., 6 charts, 79 refs. Calcutta, May 1926.

In the introduction to this paper the author points out that very little experimental work on the transmission of rinderpest of cattle by Arthropods has hitherto been attempted, and urges the importance of epidemiological data as a means of eliminating many species from consideration as possible vectors. Bacteriological investigations on rinderpest indicated that the causal organism was, in many characteristics, probably not unlike *Leptospira icteroides*, the spirochaete that causes yellow fever and is transmitted by *Aëdes* (*Stegomyia*) *argenteus*, Poir. This similarity suggested the possibility of transmission of rinderpest by an allied mosquito, and experiments with *A.* (*S.*) *albopictus*, Skuse, an abundant Indian mosquito very similar in morphology and habits to *A. argenteus*, were accordingly made, at Muktesar, United Provinces. All the mosquitos used in the experiments were bred either from eggs obtained from tree-holes or from eggs laid in the laboratory ; in rearing the larvae dead flies (*Musca* sp.) were found to be very useful as food, and rice grains were also fairly satisfactory, but tended to ferment in the incubator. Literature on the methods of keeping and feeding biting flies is reviewed, and a detailed account of those adopted by the author is given, together with observations on the feeding habits of *A. albopictus*. The results of the extensive transmission experiments with cattle subsequently proved to be susceptible to rinderpest were entirely negative. Organisms somewhat resembling *Leptospira* were found in the gut-contents of three mosquitos dissected a few hours after taking an infective feed.

Detailed records of the life-history of *A. albopictus* are given. The minimum duration of the various stages for those reared from eggs from tree-holes was incubation 18 hours (or less), larval 8 days, pupal 3 days, at about 21°C. [70° F.] ; and incubation 18 hours (or much less), larval 4 days and pupal 2 days, at 28° C. [82·4° F.]. For mosquitos reared in the laboratory the corresponding figures were 8, 12, and 5 days at 21° C., and 3, 6 and 2 days at 28° C., while the shortest period between the first feed of blood and oviposition was 7 days at 21° C., and 3 days at 28° C. The males were almost always the first to emerge. A few individuals of *A.* (*S.*) *thomsoni*, Theo., emerged from the tree-hole material after all the *A. albopictus* had emerged, but the adults could not be induced to oviposit in captivity.

The experiments with *Musca domestica*, L., and *Linognathus vituli*, L., described in detail in this paper have been noticed elsewhere [*R.A.E.*, B, xiv, 180].

KAHAN SINGH. **Surra Transmission Experiments.**—*Dept. Agric., Punjab*, Vet. Bull. 16 [*i.e.* 17], 20 pp. Lahore, 1926.

The details of these experiments with various Tabanids as transmitters of surra in camels are set out in tables. In several cases *Tabanus macer*, Big. (*bicallosus*, Ric.) transmitted the disease directly when given interrupted feeds on animals showing trypanosomes in the peripheral circulation. The experiments with uninterrupted feeding were all negative. The results of experiments with *T. virgo*, Wied., were similar to the above. Further experiments are necessary with *T. striatus*, F. (*hilaris*, Wlk.) and *T. ditaeniatus*, Macq., within the infected area, as these species cannot be induced to feed successfully after a long journey; the latter is, however, capable of direct transmission.

Ctenocephalus felis, Bch., experiments with which had previously proved negative [*R.A.E.*, B, xi, 217], transmitted the disease in one case out of ten, uninterrupted feeds only being given.

[PAVLOVSKIĬ (E. N.) & STEIN (A.K.).] **Павловский (Е. Н.) и Штейн (А. К.). The poisonous Action of the Beetle, *Paederus fuscipes*, on the Skin of Man.** [*In Russian.*]—Med. Obozr. Nizhn. Povolzh. [*Med. Rev. Lower Volga*], 1926, no. 7–8, reprint 3 pp. Astrakhan, 1926.

Experiments with crushed parts of *Paederus fuscipes*, Curt. [*R.A.E.*, B, iii, 68] have shown that the poison is contained in the blood of the insects.

FULLAWAY (D. T.). **A Poisonous Spider in Hawaii.**—*Hawaiian Forester & Agric.*, xxiii, no. 3, pp. 66–68. Honolulu, 1926.

Latrodectus mactans, F. (hourglass spider), which has recently become well established in Hawaii, is described. This poisonous spider, which occurs quite commonly in California and the southern United States, the West Indies, Madagascar, New Zealand, Algeria and Peru, is reported to cause dangerous illness, and an account of a fatal case in North Carolina is given. It is usually found in old outbuildings, under low wooden and concrete bridges, etc. Cocoons each containing about 300 eggs are spun during the summer, and at a temperature of approximately 27° C. [80·6° F.] the eggs hatch in about 30 days. The spider does not reach maturity until the following spring or early summer.

Methods of treating the bites with potassium permanganate or an antitoxic serum described by other authors are briefly noticed.

Report of the Board [of Commissioners of Agriculture and Forestry], 1925-26.—*Hawaiian Forester & Agric.*, xxiii, no. 3, pp. 88–92. Honolulu, 1926.

In the section on Plant Inspection mention is made of the introduction of wagtails (*Rhipidura tricolor*) into Hawaii from Australia for the control of the horn fly [*Lyperosia irritans*, L.]. The birds are apparently becoming established.

KOBAYASHI (S.). **Two parasitic Diptera discovered in Korea.** [*In Japanese.*]—*Kontyu*, i, no. 2, pp. 90–91. Tokyo, 1926.

In Korea larvae of *Oedemagena tarandi* are found in deer and mature at the end of March. Some larvae of *Cobboldia elephantis* were found from December to February in the excreta of an elephant that had been imported from Singapore in the previous July.

[PLESKE (Th. D.).] **Плеске (Ф. Д.). Revue des espèces paléarctiques des Oestridae et catalogue raisonné de leur collection au Musée Zoologique de l'Académie des Sciences.**—*Ann. Mus. zool. Acad. Sci. U.R.S.S.*, xxvi (1925), no. 3–4, pp. 215–230. Leningrad, 1926.

Keys are given to the palaearctic genera and species of Oestrids, and four new species from unknown hosts are described.

FABER (H.). **Exterminating the Warble Fly in Denmark.**—*Jl. Minist. Agric.*, xxxiii, no. 10, pp. 905–907. London, January 1927.

Warble-flies [*Hypoderma*] do not migrate to any great extent, so that it is possible, by systematically killing the maggots, to eradicate the pest in a district, and it should therefore be possible in the course of a few years to free an entire country. With this end in view, laws have been passed in Denmark enforcing the destruction of all maggots. On account of the severe winters all cattle are stall-fed for about 7 months and are generally taken out to the fields at the end of April. Unless the owner sends the local Council a certificate from a veterinary surgeon before 1st April, stating that his herd has been freed from maggots, the herd is inspected by Government officials and the maggots exterminated at the cost of the owner before the cattle leave the byres. As a result the number of hides damaged has dropped from 20 per cent. in 1922 to 4 per cent. in 1925, while the actual loss in value was estimated to have been reduced to one-tenth between 1922 and 1924. It is hoped that the pest will be exterminated in Denmark by 1930.

MCDANIEL (E.). **Fleas and Bed-Bugs.**—*Michigan Agric. Expt. Sta.*, Circ. Bull. 94, 8 pp., 5 figs. East Lansing, Mich., June 1926.

A popular account is given of the bionomics of fleas in general, and particularly of *Ctenocephalus felis*, Bch., *C. canis*, Curtis, and *Pulex irritans*, L. The usual measures for their control are briefly described. The bionomics and control of the common bed-bug [*Cimex lectularius*, L.] are also discussed.

CRAWFORD (M.). **Development of *Habronema* Larvae in Drosophilid Flies.**—*Jl. Comp. Path. & Therapeut.*, xxxix, pt. 4, pp. 321–323, 1 fig., 1 ref. Edinburgh, December 1926.

In the course of observations in Ceylon on the stomach contents of a horse heavily infested with larvae of *Habronema muscae* and *H. megastomum*, which had caused a tumour and ulcers in the stomach, some of the material, which had been exposed in a shed for several days, was placed under a glass beaker, and after a week Drosophilid flies were seen flying about in it. These, on being crushed, were found, in 4 cases out of 39, to be parasitised with larval Nematodes, to the number of 25 in all. The conditions of the observations left little

doubt that these larval Nematodes were derived from the stomach contents of the horse ; they were probably larvae of *H. megastomum*. Drosophilids, which are extremely common in the tropics, have been recorded as breeding in horse dung, and are therefore possible carriers of *Habronema* larvae.

BEVAN (L. E. W.). **The Influence of Dipping in Solutions of Arsenic upon the Course of Trypanosomiasis.**—*Jl. Comp. Path. & Therapeut.*, xxxix, pt. 4, pp. 284–292. Edinburgh, December 1926.

Experience in Southern Rhodesia has proved that the total eradication of ticks from an area can be accomplished by short-interval dipping of cattle, and laboratory experiments have shown that ticks placed upon a regularly dipped animal three days after the last dipping failed to develop, whereas others placed under similar conditions upon undipped animals came to maturity. It was thought that this knowledge might be used in the control of trypanosomiasis, and that the arsenic absorbed by frequent and regular immersion might act by poisoning tsetse-fly [*Glossina*] attacking the treated animals, by destroying trypanosomes in the flies imbibing blood from these hosts, by rendering the fly infertile, or by protecting the animal from the effects of infective material injected by flies when biting. Preliminary tests were made with guineapigs, and these experiments, which are described in detail, indicate that the dipping of infected guineapigs in arsenical solutions of a certain strength and at certain intervals causes the disappearance of trypanosomes from the peripheral blood. The parasite is not, however, eliminated, for when dipping is discontinued it reappears after an interval and the disease runs its normal course.

The effect of the dip seems to depend upon the strength of arsenic in the solution and the frequency of immersion. When weak solutions of Cooper's dip (1 in 300) were used, the parasite was not driven from the blood even when animals were immersed at intervals of 3 days. When, however, solutions of 1 in 156 were used, the parasites disappeared after 3, 4, or 6 dippings at intervals of 3 or 4 days. The weaker strength gives little or no protection against syringe-infection, but whether it would protect against natural infection by tsetse or other blood-sucking flies can only be determined by experiment. The dipping of syringe-infected guineapigs in the 1 : 156 strength twice a week arrested the development of the disease until dipping was suspended. Frequency of dipping is apparently an important factor. The indications are that the effect upon the parasite is due to the absorption of arsenic and its gradual accumulation, and that it acts by suppressing or arresting the development of the trypanosome rather than by destroying it. It is possible that immune bodies result from the interaction between parasite, drug and body tissues. When the drug is eliminated, the development of the parasite is resumed ; the lengthy period that sometimes elapses between the cessation of dipping and reappearance of the trypanosome points rather to the wearing out of immunity conferred by the drug than to elimination of the drug. The immersion in cold water of guineapigs infected with trypanosomiasis hastens the course of the disease. This corresponds with the practical observation that cattle, when exposed to heavy rains after attack by fly, rapidly succumb, and dipping

in arsenic too weak to affect the trypanosome might exert a similar harmful effect. As guineapigs are found to tolerate daily immersion in a dip of a strength suitable for cattle, it is thought that shorter intervals of dipping might be equally well supported by cattle. This would be of the greatest benefit in the eradication of *Rhipicephalus appendiculatus*, Neum. (brown tick), which is the vector of African coast fever, and of *Hyalomma aegyptium*, L. (striped-legged tick), which is very difficult to destroy by weekly dipping. If, however, the principle of short-interval dipping in strong dip solution is adopted for cattle infected with trypanosomiasis, it will only be practicable during weather favourable for rapid drying, otherwise scalding is likely to occur. It is hoped that the effect of arrested development of the parasite may also be obtained in the case of other blood parasites, such as *Theileria parva*, the causal organism of African coast fever.

The few experiments as yet made with cattle have unfortunately proved inconclusive, owing to the scarcity of trypanosomes in the blood, and until further tests have been carried out, short-interval dipping cannot be definitely recommended for the prevention or cure of bovine trypanosomiasis.

BEVAN (L. E. W.). **Notes from the Veterinary Laboratory.**—*Rhodesia Agric. Jl.*, xxiii, no. 11, pp. 1001–1013. Salisbury, November 1926.

This address on trypanosomiasis of cattle contains information that has already been noticed [*R.A.E.*, B, xiii, 180] and in addition discusses the results of experiments in dipping guineapigs infected with the disease [see preceding paper]. A few experiments carried out on cattle seem to indicate that though the development of trypanosomes already established in cattle can be arrested by intensive dipping (as in the case of guineapigs), the animals do not improve in condition ; it is possible, however, that if dipping is commenced before the disease has progressed too far, it may entirely prevent the establishment of the parasite. The cattle should be habituated to arsenic by regular dipping and gradually worked up to a condition of an arsenic resistance. Other precautionary measures are discussed.

PINTO (C.). **Triatomideos da Venezuela, com a descripção de uma nova especie do genero** *Eutriatoma*. [Triatomids of Venezuela, with a Description of a new Species of the Genus *Eutriatoma*.]—*Ann. Faculdade Med. S. Paulo*, i, pp. 85–87. S. Paulo, 1926.

The new family TRIATOMIDAE [*cf. R.A.E.*, B, xiv, 210] is erected for *Triatoma*, *Rhodnius* and other genera of Reduviids. *Eutriatoma arthuri*, sp. n., is described from Venezuela. The species previously known from Venezuela are : *Triatoma dimidiata*, Latr., *T. geniculata*, Latr., *T. rugulosa*, Stål, *T. maculata*, Erichson, *T. nigromaculata*, Stål, *Rhodnius prolixus*, Stål, and *Eratyrus cuspidatus*, Stål.

URIBE (C.). **On the Biology and Life History of** *Rhodnius prolixus* **Stål.**—*Jl. Parasit.*, xiii, no. 2, pp. 129–136, 1 pl., 8 refs. Urbana, Ill., December 1926.

The Reduviid, *Rhodnius prolixus*, Stål, is widely distributed in the State of Trujillo, Venezuela, up to an altitude of about 4,250 feet above sea-level, and is very common in the primitively constructed houses.

a certain degree of heat and moisture and adequate shelter being the main requisites for its presence. The author has failed to obtain any reliable evidence of *R. prolixus* occurring in the burrows of the armadillo (*Dasypus novemcinctus*) or other wild animals, as reported by Tejera, and examinations of the blood and tissues of armadillos for the presence of *Trypanosoma cruzi* have been negative. *R. prolixus* hides during the day and feeds at night, sucking the blood of man and domestic animals; the adults fly readily and are able to travel considerable distances; they are also transported in mule packs. The bite is almost painless and would be unlikely to awaken a sleeping person; the insects bred in the laboratory were allowed to suck blood from the fingers and no ill effects ensued. In two towns where *R. prolixus* is very common, endemic goitre is prevalent, but in two others where it is as common, the disease is rare.

In the laboratory eggs were laid in batches of 1–14, when possible in cracks and small holes, the total number laid by a single female ranging from 200 to 300, the number of batches laid and the number in each increasing with an increased number of feeds or amount of blood taken. At a temperature of 27–32·5° C. [80·6–90·5° F.] the eggs hatched in 12 days; at 37° C. [98·6° F.] eggs failed to hatch, even when provided with sufficient moisture. The periods required in the laboratory for each of the four larval instars and the nymphal stage are given, as well as the number of days that elapsed between moulting and feeding, and the time taken for engorgement. The larvae only engorge once in each instar, but the nymphs may feed as many as nine times. The adults fed 15 days after moulting, and egg-laying began 20 days later, the complete life-cycle occupying about 7 months. If, however, larvae were given an interrupted feed, it appeared necessary for them to feed again before moulting, so that it is probable that under natural conditions, where food is not so readily obtainable, and temperature may vary, the life-cycle is frequently much longer.

One adult female lived for 7 months without food, and larvae also lived for several months without food; they survived longer in damp places. Starving adults and larvae placed with engorged larvae and nymphs did not attack them, but on two occasions newly hatched larvae were seen to feed on the liquid faeces of engorged individuals, which contained infective forms of *T. cruzi*. If this occurs in nature, as seems probable, it would account for the high percentage of infection of *R. prolixus* with *T. cruzi*, but it is also possible that the numerous species of mammals that live in infested houses may serve as reservoirs. The numbers of larvae of different stages, nymphs, and male and female adults found naturally infected with *T. cruzi* are given; of 553 specimens of all stages 62 per cent. were infected, the percentage increasing with the advance in development and being higher in adult females than in adult males.

JOHANNSEN (O. A.). *Wohlfahrtia vigil* **a Parasite upon Rabbits.**— *Jl. Parasit.*, xiii, no. 2, p. 156. Urbana, Ill., December 1926.

The author records the occurrence of larvae of *Wohlfahrtia vigil*, Wlk., in very young rabbits that were being reared in the open, at Ithaca, New York, only a few hundred yards from where he had taken the adult flies, and suggests that the rabbit may be a natural host of this species. He also makes a correction to the description of the first instar larva previously published [*R.A.E.*, B, ix, 117].

Bromley (S. W.). **The External Anatomy of the Black Horse-fly** *Tabanus atratus*, **Fab. (Diptera: Tabanidae).**—*Ann. Ent. Soc. Amer.*, xix, no. 4, pp. 440–460, 12 figs., 46 refs. Columbus, Ohio, December 1926.

A complete and detailed description is given of the external anatomy of *Tabanus atratus*, F., and while the paper is essentially a study in morphology, it may be used as a reference for the taxonomic study of the family. The terms used in taxonomic work on Tabanids have therefore been given in comparison with the terms used by morphologists.

Richards (O. W.). **Notes on the British Species of** *Lucilia* **(Diptera).**—*Trans. Ent. Soc. London*, lxxiv, pt. 2, pp. 255–260, 3 pls., 1 ref. London, December 1926.

A key to the British species of *Lucilia* (after Stein) is given. Among the species mentioned are *L. caesar*, L., *L. sericata*, Mg., which is not common in Britain, and *L. bufonivora*, Moniez, the larvae of which develop in toads.

In supplementary notes J. E. Collin points out that the species of *Lucilia* known in British collections as *L. splendida*, Mg., is a hitherto undescribed species, *L. richardsi*, sp. n. He also gives a key to the British species.

Edwards (F. W.). **On the British Biting Midges (Diptera, Ceratopogonidae).**—*Trans. Ent. Soc. London*, lxxiv, pt. 2, pp. 389–426, 2 pls., 3 figs., 15 refs. London, December 1926.

The species here dealt with bring the list of recognised British Ceratopogonids up to 107, the new species described being *Stilobezzia lutacea*, *Palpomyia luteifemorata* and *P. brevicornis*. The author agrees with Malloch in treating the Ceratopogonidae as a distinct family [*R.A.E.*, B, vi, 83] and gives a list of the characters differentiating them from the Chironomidae. Keys are given to the British genera and many species. *Culicoides winnertzi*, n. n., is proposed for *C. pictipennis*, Winn. nec Staeg.

Howard (L. O.). **Report [1925-26] of the Entomologist.**—*U.S. Dept. Agric.*, 30 pp. Washington, D.C., 1926. [Recd. January 1927.]

In parts of Virginia where the raising of high-grade cattle is the principal industry, the cattle grubs [*Hypoderma bovis*, DeG., and *H. lineatum*, Vill.] have been found to interfere seriously with the growth and fattening of the animals, but in one locality co-operative measures of control gave good results. In Maryland, dairy cattle were sprayed regularly with pyrethrum extract, and this, together with the use of fly-traps, fans and other means of preventing entry into the dairy, gave satisfactory control of the house-fly [*Musca domestica*, L.], horn fly [*Lyperosia irritans*, L.] and stable fly [*Stomoxys calcitrans*, L.]. The internal use of sulphurised salt gave no protection to cattle against these flies. Longevity tests with the sheep scab mite [*Psoroptes ovis*, Hering] showed the maximum longevity off the host to be 31 days. Sheep pens did not remain infective more than a few days after infested animals had been removed.

Bishopp (F. C.) & Dove (W. E.). **The Horse Bots and their Control.**—*U.S. Dept. Agric.*, Farmers' Bull. 1503, 14 pp., 8 figs. Washington, D.C., September 1926. [Recd. January 1927.]

The greater part of the information contained in this bulletin on *Oestrus* (*Gastrophilus*) spp. has been noticed from other sources [*R.A.E.*, B, vi, 150 ; viii, 36].

Bedford (G. A. H.) & Hewitt (J.). **Descriptions and Records of several New or Little-known Species of Ticks from South Africa.**—*S. Afr. Jl. Nat. Hist.*, v, pp. 259–266, 2 pls. Pretoria, December 1925. [Recd. January 1927.]

The species dealt with include: *Ornithodorus péringueyi*, sp. n., taken in the Cape Province ; *Rhipicephalus theileri*, sp. n., from a ground squirrel (*Xerus capensis*) in the Orange Free State ; *Haemaphysalis silacea*, Robinson, on cattle in the Cape Province, and *Amblyomma sylvaticum*, DeG., of which the males are described ; and *Rhipicephalus evertsi* var. *albigeniculatus*, Warburton, taken on horses and cattle in South-west Africa.

Mathis (C.). **Virulence pour l'homme du spirochète de la musaraigne.**—*C.R. Acad. Sci. France*, clxxxiii, no. 14, pp. 574–576. Paris, 1926.

Spirochaeta (*Treponema*) *crocidurae* [*R.A.E.*, B, v, 98 ; vi, 103] of the shrew [*Crocidura stampfli*] appears to be closely allied to the spirochaetes of the various relapsing fevers of man. In treating paralysis by the inoculation of spirochaetes, the author injected blood from a mouse infected with *Spirochaeta crocidurae* into two patients. In the first case, after eight days of incubation the temperature rose, and remained high until the thirty-sixth day. At no time did the blood show the presence of spirochaetes, but it was nevertheless infective, a few drops being sufficient to infect mice. Similar results were obtained in the second case, in which the period of incubation was five days.

It therefore appears that the shrew is a potential reservoir of an, as yet, unknown spirochaete of man, the presence of which cannot be detected in the blood. It is probable, however, that it is not transmitted to man under existing natural conditions.

Brumpt (E.). **Transmission du** *Treponema crocidurae* **par deux** *Ornithodorus* (*O. moubata* **et** *O. marocanus*).—*C.R. Acad. Sci. France*, clxxxiii, no. 23, pp. 1139–1141. Paris, 1926.

Spirochaeta (*Treponema*) *crocidurae* occurs in the shrew (*Crocidura stampfli*) inhabiting sewers and some native houses in Dakar, and also in various rats, and has been inoculated experimentally into other animals including man [see preceding paper]. The author therefore undertook the study of its transmission by ticks such as *Ornithodorus moubata*, the natural vector of *S.* (*T.*) *duttoni*, and *O. marocanus*, which transmits *S.* (*T.*) *hispanicum* [*R.A.E.*, B, xiv, 89]. The latter spirochaete is transmissible also by *Pediculus* [*R.A.E.*, B, xiv, 168, 194], and the author has found that it may be carried by *O. moubata* and even by *Haemaphysalis inermis*. The experiments showed that *S. crocidurae*, which in nature is perhaps transmitted by the lice or fleas of insectivores and of rodents, is readily transmitted to rats by

inoculation of an emulsion of infected nymphs of *O. moubata* or *O. marocanus*. A reservoir of latent virus, such as is constituted by the insectivores and rodents frequenting dwellings at Dakar, might, therefore, become active should either of these ticks become acclimatised. This is not unlikely in the case of *O. marocanus*, which might be imported from Morocco on pigs.

[Korovnikov (A. F.).] **Коровников (А. Ф.). On the Characteristics of Endemic Relapsing Fever in Central Asia.** [*In Russian.*]—*Bull. Univ. Asie centr.*, pt. 13, pp. 81–86, 4 figs. Tashkent, 1926.

A disease, clinically almost indistinguishable from malaria, is recorded from a locality in Central Asia at an elevation of 1,700–3,000 ft. above sea-level. It occurred during the summer, amongst soldiers, the natives being apparently immune. Spirochaetes were, however, isolated from the blood and appeared to be the same as *Spirochaeta persica*, which causes Persian relapsing fever. The various types of relapsing fever are reviewed. According to Dzhunkovskiĭ Persian relapsing fever is transmitted by *Ornithodorus lahorensis*, Neum. (*tholozani*, Lab. & Mégn.) [*cf. R.A.E.*, B, xiv, 193] and *O. canestrinii*, Bir. The author's observations suggest *Argas persicus*, Oken, as the more likely vector.

Maxcy (K. F.). **An Epidemiological Study of Endemic Typhus (Brill's Disease) in the south-eastern United States with Special Reference to its Mode of Transmission.**—*Pub. Health Repts.*, xli, no. 52, pp. 2967–2995, 1 fig., 4 maps, 29 refs. Washington, D.C., 24th December 1926.

A disease giving a positive Weil-Felix reaction, and clinically indistinguishable from typhus except with regard to its relative mildness and low mortality rate, is endemic in the south-eastern United States. The epidemiology of the disease is, however, significantly different, and there is no evidence suggesting transmission from man to man by lice [*Pediculus*], unless it is assumed at the same time that the disease usually exists in an unrecognisable form. The disease occurs sporadically; there is apparently a lack of direct communication from an infected person; it is associated with the place of business rather than with the home, particularly with those premises upon which food-stuffs are handled or stored; cases recur on the same premises after considerable intervals of time; and the maximum seasonal incidence occurs during summer and autumn, whereas the maximum incidence of Old World typhus occurs in winter and spring. The hypothesis is therefore suggested that there is a reservoir of infection other than in man; and that this reservoir is afforded by rodents, probably rats or mice, from which the disease is accidentally transmitted to man through the bite of some parasitic blood-sucking arthropod.

de Mello (F.) & Cabral (J.). **Les Insectes sont-ils susceptibles de transmettre la lèpre ?**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 774–777. Paris, 1926.

Previous literature on the possible transmission of leprosy by insects is reviewed, and personal experiments in Goa are described. Microscopical examination showed slight infection in 10 bed-bugs [*Cimex*] out

of 20 taken from the beds of lepers. In bed-bugs allowed to feed on leprous patients (the presence of bacilli at the point of feeding having been previously ascertained) and then examined at different intervals, the bacilli diminished after the fourth day and completely disappeared by the eighth. In the case of *Musca bezzii*, Patton & Cragg, taken in a leper hospital, infection was found in the gut of 4 out of 10 individuals. The flies were also fed on leprous patients and then given fruit juice and sweetened water. All those examined immediately after feeding were infected, 2 hours after the feed 4 out of 6 were infected, whilst 48 hours after feeding only 2 out of 6 were infected. Flies could not be kept alive more than 48 hours. The wings and legs were removed before examination to prevent contamination by this means. Bugs and flies collected at a distance from lepers were not infected.

Bruni (N.). **Observations et recherches sur** *Trypanosoma lewisi* **et** *Schizotrypanum cruzi*.—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 791–794, 2 refs. Paris, 1926.

Trypanosoma lewisi was found in 56 out of 103 rats [*Mus norvegicus*] caught in the vicinity of the military hospital at Bologna. Even when the rate of infection of individuals is high, it does not apparently produce any serious morbid symptoms and is not passed on to the progeny. Though *Ceratophyllus fasciatus*, Bosc., and *Haematopinus spinulosus*, Denny, occurred on the rats, they were few in number and did not harbour any trypanosomes or other flagellates in the digestive tract.

Experiments in injecting *T.* (*Schizotrypanum*) *cruzi* into laboratory animals, with successful results in some cases, are briefly described.

Brug (S. L.). *Lophoscelomyia annandalei* **var.** *djajasanensis* **nov. var. (Diptera, Culicidae).**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 804–806, 3 refs. Paris, 1926.

Anopheles (*Lophoscelomyia*) *annandalei* var. *djajasanensis*, n., is described from Java; it breeds in tree-holes and has never been seen entering houses or biting man. The differences in the adult and larva between this variety and the typical form are tabulated.

Borel (M.). **Anophèles et paludisme dans la région de Chaudoc (Cochinchine). Résultats d'une enquête faite du 16 au 21 janvier 1926.**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 806–811. Paris, 1926.

The numbers of mosquitos in the neighbourhood of Chaudoc (Cochin China) have been greatly reduced as a result of recent agricultural development. *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön., was the only Anopheline caught in the town from 16th to 21st January, but did not contain malarial parasites. *A. hyrcanus* var. *nigerrimus*, Giles, only occurs during a very short period at the end of the rainy season and beginning of the dry season.

A large number of mosquito larvae are destroyed by fish and *Lutzia fuscana*, Wied. Larvae of the following Anophelines have been taken in various localities: *Anopheles* (*Neomyzomyia*) *kochi*, Dön., *A. vagus*, *A. barbirostris*, Wulp, *A. hyrcanus* var. *sinensis*, Wied., and *A.* (*Neocellia*) *fuliginosus*, Giles. Malaria is prevalent where the last three species occur.

Other mosquitos recorded are *Aëdes* (*Ecculex*) *taeniorhynchoides*, Christ., which feeds voraciously on man by day; *A.* (*Stegomyia*) *argenteus*, Poir.; *Culex malayi*, Leic.; and *C. fatigans*, Wied., the most common species entering houses.

BOREL (M.). **Paludisme en Cochinchine. Résultats de mesures prophylactiques à la plantation de Suzannah (11 au 13 août 1926).**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 811–815. Paris, 1926.

As a result of a survey of a plantation in Cochin China made in February 1925, larvae of *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön., were found in water collected in the footprints of animals on clay soil; *A.* (*Neomyzomyia*) *kochi*, Dön., occurred in the streams and waters near chain pumps; *A.* (*N.*) *leucosphyrus*, Dön., in shaded puddles and tree-holes containing rainwater; and *A. barbirostris*, Wulp, in grassy forest pools. Anti-malarial measures were organised, which included the treatment of infected persons and quinine prophylaxis, and the destruction of mosquito larvae by oiling and the introduction of fish.

In August 1926 the malaria index among children was greatly reduced. Mosquito larvae were very scarce, but included the species mentioned above, with the exception of *A. vagus*, and, in addition, *A.* (*Neocellia*) *maculatus*, Theo., *Aëdes* (*Ecculex*) *culicinus*, Edw., and *A.* (*Stegomyia*) *argenteus*, Poir. *Culex fatigans*, Wied., was taken in houses.

BOREL (M.). **Résultats d'une enquête épidémiologique et entomologique à Yaback (Annam).**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 845–852. Paris, 1926.

An account is given of a coffee plantation near Yaback, about 2,800 feet above sea-level, which is an important malaria centre. There is a high infection among the indigenous population, whereas Annamese brought from the lower altitudes appear to suffer less; this may be due to the protection afforded by the cattle near the dwellings of the latter; the former keep only pigs and poultry.

Anopheles (*Neocellia*) *maculatus*, Theo., is the most abundant Anopheline, *A. hyrcanus* var. *sinensis*, Wied., being found in very small numbers. Other mosquitos recorded are *Aëdes* (*Stegomyia*) *albopictus*, Skuse, and *Culex mimulus*, Edw. *A.* (*S.*) *vittatus*, Big., was found breeding in a vat for washing coffee.

GUILLET (R.). **Au sujet de la récente épidémie de dengue à Dakar. Note sur un cas de spirochétose humaine.**—*Bull. Soc. Path. exot.*, xix, no. 9, pp. 860–863, 6 refs. Paris, 1926.

In view of a number of cases among Europeans at Dakar recently clinically diagnosed as dengue, details are given of one case, in which spirochaetes were isolated from the blood during apyrexia and have since been maintained in mice by successive passages. The patient had not been bitten by lice [*Pediculus*], and *Ornithodorus* does not occur at Dakar, so that the spirochaete cannot be *Spirochaeta recurrentis* or *S. duttoni*. It closely resembles *S. crocidurae* [*R.A.E.*, B, xv, 50], and its reaction as regards mice is also similar.

In the discussion, Couby stated that in Syria dengue is transmitted by *Phlebotomus*, which has not yet been recorded from Dakar, and if present is certainly rare. The transmitting agent at Dakar must be more widely distributed and is possibly *Aëdes* (*Stegomyia*) [*argenteus*, Poir.]. The symptoms of the disease at Dakar are sometimes much more serious than those of Syrian dengue and resemble those of yellow fever, and this may be due to some difference in the insect vector.

Nasonov (N. V.). **Notes sur les phlébotomes I et II.**—*C.R. Acad. Sci. U.R.S.S.*, 1926, pp. 239–241, 3 refs. Leningrad, December 1926.

Porchinskii's description of *Phlebotomus grimmi* (1876) is not complete as regards the genital armature, but the author considers it very probable that it is the same species as *P. sergenti*, Parrot (1917) or *P. caucasicus*, Martz. (1917).

The local distribution of *P. papatasii*, Scop., in the Crimea is discussed, and various printer's errors in a previous paper [*R.A.E.*, B, xiv, 189] are corrected.

Adler (S.) & Theodor (O.). **The Transmission of Cutaneous Leishmaniasis to Man from artificially infected** *Phlebotomus papatasii*. —*Nature*, cxviii, no. 2976, p. 692. London, 13th November 1926.

In order to determine at what stage *Leishmania tropica* becomes infective in the sandfly, a series of attempts were made to obtain an infection of oriental sore with flagellates from artificially infected, laboratory-bred sandflies (*Phlebotomus papatasii*, Scop.) 8–15 and 21 days after the infective feed. All the sandflies were kept at a temperature of 19–23° C. [66·2–73·4° F.]. The infective feeds were made on a lesion that had resulted from an artificial infection with flagellates from a naturally infected sandfly. So far only two experiments have given positive results. In one case the sandfly hatched on 8th September 1926, fed the same day and died on 16th September, the other hatched on 7th September, fed two days later and died on 17th September. In the first case numerous flagellates were found in the pharynx, oesophagus and mid-gut of the sandfly, and in the second they occurred in the whole of the alimentary tract from pharynx to rectum. Inoculations of material from these sandflies were made into the forearms of two men, and in both cases papules containing Leishman-Donovan bodies appeared on 14th October.

Adler (S.) & Theodor (O.). **The Behaviour of Cultures of** *Leishmania tropica*, *L. infantum*, **and** *L. braziliense* **in the Sandfly,** *Phlebotomus papatasii*.—*Nature*, cxix, no. 2984, pp. 48–49. London, 8th January 1927.

In these experiments the sandflies were infected by feeding through a membrane of rabbit skin on emulsions of flagellates in inactivated rabbit serum or defibrinated rabbit blood. *Leishmania tropica*, irrespective of the age and source of the strain, when introduced into *Phlebotomus papatasii*, Scop., in this manner, behaved exactly the same as when ingested by the sandfly from oriental sores, *i.e.*, the infection,

if successful, was always present in the uppermost end of the cardia, and in two cases out of twenty flagellates were found in the pharynx.

The passage from cultures through *P. papatasii* apparently increases the pathogenicity of *L. tropica* for man. The stomach of an infected sandfly was inoculated into the scarified right forearm of a man and at the same time flagellates from the culture on which the sandfly was fed were inoculated into the left forearm. On the 1st November a papule on the right arm contained Leishman-Donovan bodies, whereas up to the time of writing (16th November) nothing had been observed on the left arm.

L. braziliense ingested by *P. papatasii* from emulsions of flagellates behaved quite differently from *L. tropica*. Although active division and marked morphological changes occurred in the sandfly, the flagellates were confined to the stomach, except that in two cases out of twenty flagellates were also found in the lowest part of the cardia. They never occurred in the uppermost part of the cardia or in the neighbourhood of the oesophageal valve, nor were any forms found attached to the epithelium. These observations and those made in India on the development of *L. donovani* in *P. argentipes*, Ann. & Brun. [*R.A. E.*, B, xiv, 143; xv, 16, etc.] indicate that the sandfly in which flagellates of a species of *Leishmania* are found attached to the epithelium and free in the uppermost part of the cardia is the carrier of that species, *e.g.*, *P. papatasii* is the carrier of *L. tropica*, and *P. argentipes* is the carrier of *L. donovani*. Should the results with recently isolated strains of *L. infantum* be similar to the above, they would indicate that the carrier of this organism is probably some other species of *Phlebotomus*, and not *P. papatasii*. The similarity in the behaviour of cultures of *L. tropica* and ingested Leishman-Donovan bodies suggests that the simple and rapid method of observing the behaviour of cultures of a given species of *Leishmania* in sandflies may be used to determine the particular vector.

PARROT (L.) & FOLEY (H.). **Le bouton d'Orient en Algérie. Remarques étiologiques et épidémiologiques.**—*Arch. Inst. Pasteur Algérie*, iii, no. 4, pp. 333–343, 23 refs. Algiers, 1925. [Recd. January 1927.]

The distribution and incidence of oriental sore in Algeria are discussed. At Biskra, the maximum activity of *Phlebotomus* occurs from the last fortnight of May to the end of June and from mid-August to the end of September, the flies being much more numerous during the second period, and similar variations in the numbers are found at Figuig. If the incubation period of oriental sore is allowed for, the maximum incidence of the disease corresponds with these periods.

SERGENT (Edm. & Et.). **Exposé critique des méthodes antipaludiques.** —*Arch. Inst. Pasteur Algérie*, iii, no. 4, pp. 359–378, 4 refs. Algiers, 1925. [Recd. January 1927.]

In this review of the work against malaria during the last 25 years at the Pasteur Institute, Algeria, the anti-mosquito measures that have been studied are explained and the advantages and disadvantages of many of them are discussed.

KIEFFER (J. J.). **Nouveaux genres et nouvelles espèces de Chironomides piqueurs.**—*Arch. Inst. Pasteur Algérie*, iii, no. 4, pp. 405–430, 7 figs. Algiers, 1925. [Recd. January 1927.]

Among the blood-sucking Ceratopogonids dealt with, descriptions are given of the following new species: *Holoconops becquaerti*, from Honduras, *Atrichopogon horni*, from Ceylon, *Prosapelma* (gen. n.) *cinerea*, from Hungary, *Culicoides biscapus* (which bites man), from Cochin China, *Alluaudomyia gloriosa*, from Austria, *Xylocrypta copiosa*, from Bohemia, *Serromyia gelida*, from Norway, *Kempia sphagnalis* and *Dasyhelea estonica*, from Estonia, *D. biunguis*, *D. saprophila*, *Forcipomyia sphagnophila*, *F. sanguinolenta*, *Trishelea crassiforceps*, *T. longipalpis*, *T. magniforceps*, *Anakempia turfacea*, *A. conjuncta*, *Diplohelea* (gen. n.) *parvula*, *Palpomyia murina* and *P. adusta*, from Germany, *P. bryocrypta*, from Lorraine, *Bezzia monacantha* and *B. phragmitis*, from Germany, and *B. digramma*, from Silesia.

DELANOË (G.). **La Phtiriase des cils à Mazagan.**—*Arch. Inst. Pasteur Algérie*, iii, no. 4, pp. 431–433. Algiers, 1925. [Recd. January 1927.]

Infestation of the eyelashes by *Phthirus* (*Phthirius*) *pubis*, L., is peculiar to the poor Jewish population of Mazagan (Morocco), the louse being found among the eyelashes of practically every member of any infested family. Blepharitis, however, is never observed in infested persons, nor are those suffering from blepharitis infested with the louse. The eggs are laid on the eyelashes, and the lice, once attached to the follicles, do not move, and apparently cause no discomfort. *Pediculus capitis*, DeG., has never been found in the eyelashes. The treatment followed is to wash the edge of the eyelids with cocaine at 5 per cent. strength, in order to make the parasites release their hold, brushing them 10 minutes later with a glass stylet covered at the end with cotton dipped in mercurial oil. This treatment is repeated 3 or 4 times, any parasites still remaining being picked off with forceps.

SENEVET (G.). *Anopheles algeriensis* **transmet-il** *Filaria bancrofti* **?**—*Arch. Inst. Pasteur Algérie*, iii, no. 4, pp. 434–435, 4 refs. Algiers, 1925. [Recd. January 1927.]

The author points out that in the abstract of a paper by A. Weiss [*R.A.E.*, B, i, 43] *Anopheles algeriensis*, Theo., was erroneously recorded as the carrier of *Filaria bancrofti* in man and of *F. immitis* in dogs, whereas *Culex fatigans*, Wied., is the carrier of both species of *Filaria*. This error has been repeated in the literature [*R.A.E.*, B, vii, 58; x, 180].

SERGENT (Edm. & Et.), PARROT (L.), DONATIEN (A.) & BÉGUET (M.). **Observation et iconographie d'un clou de Biskra** [oriental sore] **transmis par** *Phlebotomus papatasii* (**Scop.**). **Etude expérimentale du virus.**—*Arch. Inst. Pasteur Algérie*, iv, no. 1, pp. 1–19, 14 pls., 15 refs. Algiers, 1926. [Recd. January 1927.]

This is a reprint of a paper previously noticed [*R.A.E.*, B, xiv, 134]; additional illustrations are given.

SERGENT (Edm. & Et.), FOLEY (H.) & PARROT (L.). **Observations statistiques sur le bouton d'Orient en Algérie.**—*Arch. Inst. Pasteur Algérie*, iv, no. 1, pp. 20–25, 1 pl. Algiers, 1926. [Recd. January 1927.]

Observations made in 1925 prove that multiple infections of oriental sore are much more frequent in the Sahara than in the Tell, and that this distribution corresponds with the density of *Phlebotomus*, which is much greater in the Sahara than on the coast and in the high Algerian plateaux. Infection is also much more frequent among Europeans than natives, partly owing to greater receptivity of the skin and also owing to the fact that Europeans, being less inured to the hot climate, are apt to uncover the body to a greater extent during the night, while natives are almost invariably attacked on the face only.

BERTRAND (M.). **Un nouveau cas de leishmaniose cutanée dans le Tell.**—*Arch. Inst. Pasteur Algérie*, iv, no. 1, p. 30, 1 pl. Algiers, 1926. [Recd. January 1927.]

An indigenous case of oriental sore is recorded from the Tell, in a high mountain region (altitude over 3,000 ft.) not far from the coast, where, although *Phlebotomus* is observed almost every year, the disease has not previously been known.

KIEFFER (J. J.). **Ceratopogoninae : Clé de détermination des genres.**—*Arch. Inst. Pasteur Algérie*, iv, no. 1, pp. 96–107, 4 figs. Algiers, 1926. [Recd. January 1927.]

This key covers the genera of Ceratopogonids described up to September 1922.

PARROT (L.). **Comment recueillir les Phlébotomes.**—*Arch. Inst. Pasteur Algérie*, iv, no. 1, pp. 108–109. Algiers, 1926. [Recd. January 1927.]

Phlebotomus spp. begin to appear in Algeria in early May on the coast and in April in the Sahara and disappear in November, the numbers generally diminishing during the hottest months (July and August). During the daytime the flies may be observed in dark corners of buildings, and frequently at nightfall fly to the windows. The method of capturing them in glass tubes in which has been inserted cotton wool soaked in chloroform is described. The open end of the tube should be held over the captured fly long enough for the chloroform to take effect. The flies are then dropped into a flask containing 70 per cent. alcohol.

SERGENT (Edm.). **Rapport sur le fonctionnement de l'Institut Pasteur d'Algérie en 1925.**—*Arch. Inst. Pasteur Algérie*, iv, no. 1, pp. 111–142, 56 refs. Algiers, 1926. [Recd. January 1927.]

The routine work of 1925 is described and includes a survey of the malaria situation and the results of a study of oriental sore. It is evident that the latter disease is not confined to oases of the eastern Sahara where it was first discovered, and that there is no place either in the Tell or the Sahara where man in completely secure from infection.

(K3281) Wt P2/D45 1,500 4/27 H & Sp Gp 52

DONATIEN (A.). **Le diagnostic des piroplasmoses.**—*Arch. Inst. Pasteur Algérie*, iv, no. 2, pp. 161–221, 22 figs., 2 refs. Algiers, June 1926. [Recd. January 1927.]

The object of this paper is to provide a practical guide for the diagnosis of the piroplasms of domestic animals, which are of great importance to the stock-raising industry, especially in North Africa.

The piroplasms, in the broad sense (including *Anaplasma*), all of which are transmitted by Ixodids, but which may in some cases also be transmitted hereditarily in the mammalian host, as has been proved with *Theileria dispar* and *Anaplasma marginale* in cattle and *Nuttallia equi* in equines, are discussed first generally and then individually. In the latter part the distribution and epidemiology of the species pathogenic to cattle, sheep and goats, equines, and dogs throughout the world are dealt with briefly, but the specific vectors are only mentioned in the case of *Piroplasma canis* in dogs, which is transmitted by *Dermacentor reticulatus*, F., in France in autumn and winter, by *Haemaphysalis leachi*, Aud., in South Africa in summer and autumn, and by *Rhipicephalus sanguineus*, Latr., in some other countries in spring and summer.

LESTOQUARD (F.). **Les piroplasmoses du mouton et de la chèvre.**—*Arch. Inst. Pasteur Algérie*, iv, no. 2, pp. 222–317, 7 pls., 4 photos., 13 charts, 77 refs. Algiers, June 1926. [Recd. January 1927.]

This critical study of the piroplasms of sheep and goats presents a summary of the results of investigations carried out in Algeria and elsewhere on the morphology and classification of the parasites and the nature, epidemiology, treatment and prophylaxis of the diseases that they produce. The author has found by inoculation of infective blood, except in the case of *Theileria ovis*, which was not available for experiment, that the piroplasms of sheep can be transmitted to goats and re-transmitted from them to sheep, producing identical reactions in the two animals. He therefore considers the species described from goats to be synonymous with those from sheep, and recognises five parasites, namely *Piroplasma ovis*, *Babesiella ovis*, *Gonderia hirci* (*ovis*), *Theileria ovis* and *Anaplasma ovis*, which he deals with first generally and then individually, as common to both sheep and goats. He retains the name *Gonderia ovis* in spite of the priority of *G. hirci*. Attempts to inoculate *B. ovis* and *A. ovis* into cattle gave negative results, and, although the piroplasms of sheep and goats show a marked analogy with those of cattle, they are certainly distinct from them.

The piroplasms of sheep and goats, as of all other animals, are transmitted naturally by ticks, but in most cases the specific identity of the vector has not been proved. *G. hirci* is also transmissible hereditarily in sheep. Transmission usually occurs in natural pastures, but animals kept in yards may also be infected by ticks introduced in forage. The author considers that, in many parts of the world, the control of ovine piroplasmoses by tick destruction is impracticable, and that reliance must be placed in immunisation by inoculation. In North Africa the rotation of pastures is economically impossible, because the climate often renders the existing pasturage inadequate, and many of the shepherds are nomads, whose flocks sometimes travel many miles in a single day; dipping also presents apparently insurmountable difficulties, as it must be universal to be effective.

Sergent (Edm.), Donatien (A.), Parrot (L.), Lestoquard (F.) & Plantureux (E.). **Les piroplasmoses bovines dues aux** *Babesiella.* **Etude d'ensemble, avec description d'une espèce nouvelle :** *B. major*, **originaire de France.**—*Arch. Inst. Pasteur Algérie*, iv, no. 2, pp. 318–339, 6 figs., 31 refs. Algiers, June 1926. [Recd. January 1927.]

Babesiella major, sp. n., is described from a calf imported into Algiers from France, and compared with the other known species of *Babesiella* pathogenic to cattle. It is morphologically very similar to the piroplasm believed to be the causal agent of rupture of the spleen in cattle in Germany and Holland, of which *Haemaphysalis cinnabarina punctata*, C. & F., is considered by Knuth to be the probable vector. It proved, however, to be extremely benign when inoculated into calves at Algiers.

Flu (P. C.). **L'organisation de l'hygiène dans les colonies hollandaises.**—*Acta Leidensia Scholae Med. trop.*, i, pp. 112–142. Leyden, 1926.

In the Dutch East Indies the source of plague infection, which is transmitted by *Xenopsylla cheopis*, Roths., is the domestic rat, *Mus rattus griseiventer*, living inside the bamboos used in the construction of native houses, and the disease seldom occurs in well-built, clean houses. Malaria is carried by *Anopheles* (*Myzomyia*) *ludlowi*, Theo., in the coastal regions, and by *A. aconitus*, Dön. (*M. albirostris*, Theo.) in the hills. Under certain conditions *A.* (*M.*) *hyrcanus* var. *sinensis*, Wied., and *A.* (*Cellia*) *kochi*, Dön., are capable of causing serious epidemics.

In Dutch Guiana Anopheline mosquitos include the malaria carriers, *A.* (*C.*) *albimanus*, Wied., and *A.* (*C.*) *argyritarsis*, R.-D., breeding near bushes, woods and rice-fields, wherever clear water collects. Filariasis is carried by *Culex fatigans*, Wied., and the yellow fever mosquito, *Aëdes argenteus*, Poir., which are very common in towns owing to the lack of a pipe-borne water supply.

van Thiel (P. H.). **Was ist** *Rickettsia melophagi ?* [What is *R. melophagi ?*]—*Acta Leidensia Scholae Med. trop.*, i, pp. 324–334, 1 pl., 18 refs. Leyden, 1926.

According to Woodcock the rickettsian bodies (*Rickettsia melophagi*) from the sheep ked, *Melophagus ovinus*, are free metachromatic bodies from the crithidial form of *Trypanosoma melophagium*. It is here stated that the metachromatic bodies from crithidias are volutine bodies. Rickettsias do not show the Meyer volutine reactions, and are not dissolved in 5 per cent. sodium carbonate solution as the metachromatic bodies are. When *M. ovinus* dies, the crithidial bodies in it survive for a few days and then degenerate, and in one form of degeneration these bodies show a great similarity to *Rickettsia*.

Ciurea (I.). **Sur un cas de gale chez l'Oie.**—*Archivia veterinaria*, xviii, no. 3–4, pp. 64–67. Bukarest, 1925. (Abstract in *Bull. Inst. Pasteur*, xxiv, no. 23, p. 1061. Paris, 15th December 1926.)

A case of mange in a goose caused by *Cnemidocoptes prolificus*, R. & H., is recorded. The cervical region was bare and covered with nodules containing numerous larvae.

Mackerras (I. M.). **The Mosquitoes of the Sydney District.**—*Aust. Nat.*, vi, pt. 3, pp. 33–42. Sydney, October 1926. [Recd. January 1927.]

This annotated list of 28 mosquitos recorded from the Sydney district includes *Anopheles annulipes*, Wlk., *A. atratipes*, Skuse, *A. stigmaticus*, Skuse, and *Culex fatigans*, Wied., but not *Aëdes argenteus*, Poir. The only mosquito-borne disease recorded in the district is malaria, and of this only two cases are definitely known to have occurred. There is no reason to expect that dengue or filariasis will ever occur, though the vector of the latter, *C. fatigans*, is present in considerable numbers. *A. stigmaticus*, *Rachionotomyia tasmaniensis*, Str., and *C. sitiens*, Wied., are recorded for the first time from the Sydney area, while *C. basicinctus*, Edw., is new to New South Wales.

It is very doubtful if anti-larval measures are justifiable in the Sydney district, owing to their cost and the inconvenience to householders. If undertaken, they should be strictly limited to domestic species and those breeding in salt marshes. The most important in this connection are *C. fatigans*, for the control of which all tins likely to contain water should be removed and special attention paid to polluted water, and *A.* (*Ochlerotatus*) *vigilax*, Skuse, which is prevalent throughout the warmer months, biting chiefly by day. It breeds apparently exclusively in the mangrove swamps.

Petrocchi (J.). **Contribución al estudio de los Culicinae en la Rep. Argentina.** [A Contribution to the Study of the Culicinae of Argentina.]—*An. Dept. Nac. Hig.*, xxxi, no. 2, pp. 56–60, 1 pl. Buenos Aires, July–December 1925. (With a Summary in French.) [Recd. January 1927.]

The genus *Taeniorhynchus* (*Mansonia*) is represented in Argentina by *T. titillans*, Wlk., and *T. fasciolatus*, Lynch.

Moznette (G. F.). U.S. Bur. Ent. **Mosquito Survey of Bamboo Key, Florida.**—*Qtrly. Bull. State Plant Bd. Florida*, xi, no. 1, pp. 7–10. Gainesville, Fla., October 1926. [Recd. January 1927.]

This paper has already been noticed from another source [*R.A.E.*, B, xii, 195].

Bangerter (H.). **Culicidae von Bern.**—*Mitt. schweiz. ent. Ges.*, xiii, no. 9, pp. 473–475. Berne, 15th December 1926.

These observations were made in 1924, chiefly in the immediate neighbourhood of the city of Berne. The mosquitos recorded are all species of wide distribution that occur in France and Germany.

Brug (S. L.). **The geographical Distribution of Mosquitoes in the Malayan Archipelago.**—*Meded. Dienst Volksgezondheid Ned.-Indië*, Foreign edn., 1926, no. 4, pp. 471–482, 1 map. Batavia, 1926.

Lists are given of the Anopheline and Culicine mosquitos arranged in groups according to their faunistic relationships [*cf. R.A.E.*, B, xiii, 79], with notes on the distribution of each species, and the type of fauna of each area. In a paper already noticed [*R.A.E.*, B, xii, 113]

Edwards considered *Anopheles pseudobarbirostris*, Ludl., to be a synonym of *A. bancrofti*, Giles, but on the ground of wing markings the author thinks the former should be given varietal rank. It occurs in the Philippines and Celebes.

Scharff (J. W.). **An Experiment with Paris Green as an *Anopheles ludlowi* Larvicide.**—*Malayan Med. Jl.*, i, no. 4, p. 14. Singapore, December 1926.

An experiment was carried out to test the relative efficiency and cost of an application of oil and Paris green against *Anopheles ludlowi*, Theo. The two tidal pools chosen were almost identical in size (about 20 ft. square, with an average depth of 2 ft.) and in every essential feature. The edges of both pools were covered with weeds and in the centre of each was a mass of algae, probably *Enteromorpha*, that appeared to be particularly favoured by the Anophelines ; this vegetation offered an opportunity of testing the powers of penetration of the larvicides. The density of the Anophelines was also approximately the same.

Half a pint of oil mixture, consisting of 50 parts Solar oil, 5 parts kerosene, and 10 parts crude oil, was mixed with sawdust and immediately scattered carefully over one of the pools. Half an ounce of Paris green (56·5 per cent. arsenic) was mixed with 100 parts by volume of dry sawdust and scattered over the other.

The following day the first pond showed a fine film of oil, the vegetation was beginning to decay, aquatic insects had disappeared, and only three living Anopheline larvae were captured, sheltering among grass at the edge of the pond, and these died within a few hours.

In the second pond there was no apparent change and numerous aquatic insects were in evidence, but not a single live Anopheline larva could be found, though several dead ones were recovered from the algae.

The following day no larvae could be found in either pond, but on the third day considerable numbers of newly hatched Anopheline larvae were present.

The conclusions are that Paris green (1:100) can be used effectively at a cost considerably below that of oiling (the minimum lethal dose was not established) ; that this mixture is much lighter and easier to apply than oil ; that it gives no indication of its presence other than a little sawdust residue, whereas the effect of the oil is very noticeable ; and that both the mixtures rapidly lose their toxic powers. Further trial of the Paris green mixture is strongly recommended, particularly in those breeding-places of *A. ludlowi* that are otherwise difficult to deal with.

Martini (—). **Arsen zur Malariabekämpfung.** [Arsenic in Work against Malaria.]—*Anz. Schadlingsk.*, iii, no. 1, pp. 7–8. Berlin, 15th January 1927.

This paper reproduces briefly Hackett's work on the use of Paris green as a larvicide for *Anopheles* [*R.A.E.*, B, xiv, 17] and refers to Roubaud's suggestions for replacing Paris green by arsenic trisulphide, etc. [B, xiv, 120]. The author obtained good results in Anatolia by closely following Hackett's instructions.

Valenzuela (A. J.). **Die Republik Ecuador und ihre Pathologie.** —*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 1, pp. 13–20. Leipzig, January 1927.

Since 1909, yellow fever has not occurred in the coastal region of Ecuador ; it never occurs in the mountainous interior as the vector, *Aëdes argenteus*, Poir. (*Stegomyia calopus*, Mg.), cannot live at such altitudes. American trypanosomiasis [caused by *Trypanosoma cruzi*] is found on the coast and in the eastern area ; Reduviid bugs occur there, although the usual vector, *Triatoma megista*, Burm., has not yet been recorded. Insects infesting man include *Cochliomyia* (*Chrysomyia*) *macellaria*, F., *Dermatobia hominis*, Say (*cyaniventris*, Macq.) and *Tunga* (*Sarcopsylla*) *penetrans*, L.

Beselin (O.). **Lebende Nymphe einer Ohrzecke** (*Otiobius megnini*) **im Gehörgang einer aus Bolivien zugereisten Patientin.** [The living Nymph of an Ear Tick (*Ornithodorus megnini*) in the Ear of a Patient from Bolivia.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 1, pp. 44–45, 3 refs. Leipzig, January 1927.

A living nymph of *Ornithodorus* (*Otiobius*) *megnini*, Dug., was removed at Hamburg from the ear of a patient who had left Bolivia some months previously.

Loubser (J. N. W.). **Ueber Ohrzecken** (*Ornithodorus megnini*) **bei Menschen in Süd-Afrika.** [On Ear Ticks (*O. megnini*) infesting Man in South Africa.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 1, p. 45. Leipzig, January 1927.

Ornithodorus megnini, Dug., appeared on animals in the Transvaal and Orange Free State about 1922, and soon became a serious pest. In 1923 and 1924, the author observed several cases of infestation of the ear in man, though patients only notice the presence of the ticks when they move or press on the drum of the ear. Removal was effected by douching the ear with tepid water.

[Kotlán (S.)] Kotlan (A.) & Chandler (W. L.). **A newly recognised Fluke Disease (Prosthogonimiasis) of Fowls in the United States.** —*Jl. Amer. Vet. Med. Assoc.*, lxvii, N.S. xx, no. 6, pp. 756–763, 2 figs., 3 refs. Detroit, Mich., September 1925.

On the Rôle played by Dragonflies in the Transfer of *Prosthogonimus*.—*Ibid.*, lxx, N.S. xxiii, no. 4, pp. 520–524, 1 fig., 1 ref. Detroit, Mich., January 1927.

Flukes of the genus *Prosthogonimus*, which cause a disease of the oviduct in fowls in certain countries in Europe, were discovered by one of the authors in the oviduct of a mallard from a lake in Michigan, in 1921. Later several fowls that had access to the same lake died, and post-mortem examinations revealed the presence of flukes of the same genus.

Examination of various insects and snails from the lake in an attempt to find an intermediary host of the flukes, revealed a number of encysted larval flukes (metacercariae) in the abdominal cavities of the larvae (naiads) and adults of at least four species of dragonflies, including *Tetragoneuria* sp. In the experiments carried out in 1925 and 1926 all the female birds fed on larvae and adults of these dragonflies, when killed some time later, were found to harbour flukes, with one exception

in which only fluke eggs were found. Birds fed on the empty cases of dragonfly larvae were not parasitised, and no metacercariae were found in the walls of the cases.

The extent of infestation of the dragonflies in that vicinity was greatly reduced in 1926. The fowls on the farm from which the dragonflies were taken had been kept from the water's edge during the previous year, and only a few mallards were present on the lake.

SULDEY (E. W.). **La Dengue du Soudan.**—*Bull. Soc. Path. exot.*, xix, no. 10, pp. 881–884, 2 refs. Paris, December 1926.

The clinical aspect of Sudanese dengue fever is discussed, and it is remarked that when Roubaud identified *Phlebotomus papatasii*, Scop., in that region he expressed astonishment that in spite of the abundance of these Psychodids, no record of the fever caused by *Phlebotomus* had apparently been made. *P. duboscqui*, Nev.-Lem., and *P. minutus*, Rond., have since been found there ; *Aëdes* (*Stegomyia*) [*argenteus*, Poir.] also occurs at the same season, and the early symptoms of yellow fever and of dengue fever being identical, there is some doubt as to whether this mosquito may play any part, or whether the dengue fever may be merely due to the sandflies, which occur concurrently with the onset of the disease. The author is inclined to think that the latter are of primary importance, for the abundance and distribution of the mosquito does not seem to coincide with the outbreaks of dengue.

[SHINGAREV (N. I.).] SCHINGAREW (N.). **La revision des Anophèles de Russie.**—*Bull. Soc. Path. exot.*, xix, no. 10, pp. 896–899. Paris, December 1926.

Much of this information on the Anophelines of Russia was given in an earlier paper [*R.A.E.*, B, xiv, 129]. Fuller descriptions of the new forms there recorded are given and Favr's description of *A. sacharovi*, written in 1903, is reproduced. The author does not consider that *A. superpictus* var. *vassilievi*, Portsch., and *A. pulcherrimus* var. *atropotenae*, Lindt., are entitled to varietal rank, and regards *A. pseudopictus* var. *flerowi*, Portsch., as a synonym of *A. hyrcanus*, Pall.

DELORME (M.). **Transmission expérimentale de** *Sarcoptes scabiei* **var.** *cuniculi* **au Cynocéphale** (*Papio sphinx*, **E. Geoff.**).—*Bull. Soc. Path. exot.*, xix, no. 10, pp. 899–900, 1 ref. Paris, December 1926.

It has been previously found that mange of rabbits, caused by *Sarcoptes scabiei cuniculi*, Gerlach, is transmissible to guineapigs and to ferrets, but not to dogs, sheep, cows, pigs and horses. The author has succeeded in infecting a baboon by binding infected skin from the ear of a rabbit on to the shaved head of the animal. The infection was clearly marked, but remained definitely localised and disappeared in three weeks.

ABBATUCCI (S.) & ROUBAUD (E.). **Expériences sur un liquide insecticide commerciale à base de pétrole et de poudre de pyrèthre.**—*Bull. Soc. Path. exot.*, xix, no. 10, pp. 901–903. Paris, December 1926.

The authors describe experiments with a proprietary insecticide known as Fly-tox, which contains paraffin and pyrethrum. It is

supplied with a metal hand-sprayer discharging a fine mist of the liquid, which is non-toxic to the operator, only slightly inflammable, and without disagreeable odour. Three samples, differing in the relative concentration of pyrethrum and in colour, odour, etc., were tried experimentally, and were found to kill small insects such as bugs [*Cimex*], fleas, and mosquitos almost instantaneously, while more resistant ones, such as flies or cockroaches, died after intervals varying between a few minutes and one or two days, the immediate effect in all cases being semi-paralysis, lasting until death. A table shows the time required for each of these three samples to kill these and other insects.

Borel (M.). **La constitution du sol et le paludisme en Cochinchine.**— *Bull. Soc. Path. exot.*, xix, no. 10, pp. 935–942. Paris, December 1926.

A large part of Cochin China, constituting the deltas of four rivers, is highly alluvial and is chiefly used for rice cultivation. To the east lies a region of greyish soil formed by the disintegration of rocks and old water-courses, where tobacco, sugar-cane and edible crops are cultivated, and where rubber, if sufficiently manured, can be successfully grown. Further east again is a zone of reddish soil of basaltic origin, at one time volcanic, rich in iron, phosphoric acid and manganese, and extremely fertile. The provinces comprising these different areas are enumerated and shown on a map. The areas of malaria incidence are found to coincide with these differences in soil to a remarkable degree; in the first two classes there is little, if any, malaria, which is only there in a benign form at definite seasons, while in the red soil region intense malaria occurs in severe form throughout the year. The clay is favourable to the establishment of permanent breeding-places of *Anopheles*, while the organic débris resulting from vegetable growth assures food during the larval development, and thus maintains the malaria incidence. This rises to the point of epidemicity when any fresh clearing operations are undertaken, with the consequent introduction of infected and susceptible persons, the extension of the larval breeding-places, and, as a direct result of clearing the forest, the appearance of one of the most important malaria carriers, namely, *Anopheles* (*Neocellia*) *maculatus*, Theo. Several factors, including the scattered nature of the population, the miserable conditions of living and the absence of large animals, react on each other to perpetuate the disease. The red soil region, in spite of its fertility, is practically deserted, and only a few miserable villages remain. If, therefore, any big construction work is undertaken or any large cultural concession worked, it is only done at the cost of many lives, unless very stringent prophylaxis is consistently carried out. Cattle, buffalos, etc., which are necessary and abundant in the agricultural regions to the west, practically disappear in the red soil forests; in any case, the method of stabling them in Cochin China prevents full use being made of them as protection, for the buildings in which they are kept are quite open, and few Anophelines are found in them. The stables of the Institut Pasteur at Saïgon are model buildings, but as the doors are often left open, Anophelines are numerous, the species concerned being *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön. Pigs and poultry, which seem to offer no protection, are the only animals reared in the red soil region. In the grey soil region, the porous nature of the soil is a protection

against mosquitos other than the commonest forms, while in the alluvial region, in which both sand and clay occur in almost equal proportions, cultivation is an important factor because the rice-fields, when flooded, contain numerous fish, some of which devour the larvae ; malaria there is of limited extent and is confined to the beginning and end of the rainy season.

LARROUSSE (F.). **Etude biologique et systématique du genre *Rhodnius* Stål (Hémiptères, Reduviidae).**—*Ann. Parasit. hum. & comp.*, v, no. 1, pp. 63–88, 9 figs., 28 refs. Paris, 1st January 1927.

This is a critical review of the biology and classification of the genus *Rhodnius*, which is confined to the northern part of South America and the southern part of Central America, the limits of its known distribution being the 13th degree of north latitude and the 25th degree of south latitude, while it is commonest between the 10th degree north and the 5th degree south. Two species are known to be vectors of *Trypanosoma cruzi*, *R. prolixus*, Stål, in Venezuela, and *R. brumpti*, Pinto (which has been recorded previously as *R. pictipes*, Stål [*R.A.E.*, B, xiv, 74]) in Brazil. Infection with *T. cruzi* by means of the bite of *Rhodnius* is exceptional, as only the excreta contain infective forms, but the fact that larvae and nymphs of *Rhodnius* defaecate immediately after withdrawing their rostrum from the punctures [*R.A.E.*, B, i, 188], thus providing more opportunity for infection through them, makes them more dangerous as vectors of the disease than species of *Triatoma*, which do not defaecate until some seconds or even minutes after feeding. Brumpt, however, is of the opinion that infection most often takes place by contamination of the mucus of mouth, nose or eye with infective excreta. The importance of cannibalism and coprophagy in enabling individuals of *Rhodnius* that have not sucked infective blood from vertebrates to become infected has been pointed out by Brumpt [*R.A.E.*, B, iii, 56].

In the laboratory in Paris, at a temperature of 25° C. [77° F.] and allowed to suck blood every 15 days, *R. prolixus* completes its life-cycle from egg to egg in 4 or, more often, 5 months ; the eggs are laid singly, 5–6 days after mating, and hatch in 15–20 days, and the larvae take their first feed 4–5 days later ; the larvae engorge rapidly (in 2–3, or at most 5–10 minutes) and reach the nymphal stage after 4 moults ; the nymphs and adults engorge much more slowly, taking 20–40 minutes. If the larvae and nymphs are allowed to suck blood at intervals of 25–30 days, the life-cycle occupies 8–10 months, and it is probable that in nature its duration varies from 5 to 12 months [*cf. R.A.E.*, B, xv, 48]. The methods of rearing *R. prolixus* and other blood-sucking Rhynchota in the laboratory are described ; the author prefers to use pigeons for feeding them, as birds are not susceptible to infection with *T. cruzi*.

The author discusses the classification of the blood-sucking REDUVIIDAE, giving a key to the genera, with notes on the species of *Rhodnius*. He describes and figures *R. prolixus*, *R. pictipes*, *R. brèthesi*, da Matta, *R. domesticus*, Neiva & Pinto, *R. brumpti*, Pinto, and *R. robustus*, sp. n., the last from French Guiana and the upper Amazon (Brazil). He considers that *R. limosus*, Wlk., is a synonym of *R. pictipes*, not of *R. prolixus* as stated by Champion and by Neiva &

Pinto, and that *R. brumpti* may prove to be a synonym of *R. nasutus*, Stål, though the description of the latter is inadequate. The distribution of these species is indicated.

Brocher (F.). **A propos de la capture de larves d'Anophèles par les Utriculaires.**—*Ann. Parasit. hum. & comp.*, v, no. 1, pp. 46–47, 1 ref. Paris, 1st January 1927.

In connection with two papers by Brumpt and Langeron on the capture of mosquito larvae by the bladders of aquatic plants of the genus *Utricularia* [*R.A.E.*, B, xiii, 170], in which these writers assume that the larvae penetrate into the bladder by pushing against the valve that closes it, the author summarises the conclusions that he himself reached in a study of the function of the bladders [*Ann. Biol. lacustre*, v, pp. 33–46 ; Brussels, 1911]. He found that small animals were attracted to and fed on the secretion of glands close to the opening of the bladder, and that the valve then opened and a current was produced that drew them into the bladder. These observations have been confirmed by C. L. Withycombe [*Jl. Linn. Soc., Bot.*, xlvi, pp. 401–413 ; London, 1924]. With reference to Brumpt's suggestion that mosquito larvae may be attracted to the bladders by bubbles of gas (probably oxygen) that they contain, the author states that in his opinion the gas is air and occurs only in the bladders of plants that have been withdrawn from the water.

Hegner (R. W.). **The Interrelations of Protozoa and the Utricles of** *Utricularia*.—*Biol. Bull.*, l, no. 3, pp. 239–270, 5 figs., 14 refs. Wood's Hole, Mass., March 1926. Reprinted in : *Sch. Hyg. & Pub. Health Johns Hopkins Univ., Coll. Papers*, vii, no. 17. Baltimore, Md., June 1926. [Recd. January 1927.]

The author's conclusions with regard to the way in which the bladders of *Utricularia vulgaris* capture aquatic animals, as observed in Maine, confirm those of Brocher and Withycombe [see preceding paper] and T. Ekambaram [*Agric. Jl. India*, xi, Ind. Sci. Cong. no., pp. 72–79 ; Calcutta, 1916]. Brumpt has noticed that mosquito larvae are often captured in the bladders with their tails inwards and their heads extending out of the entrance ; the author suggests that this may be explained by the larva stimulating the bladder to action by the vigorous movement of the ventral brush of the anal segment in swimming. The protozoa that are found in the bladders are probably all free-living species that have been captured.

Holmes (F. O.). **Non-pathogenicity of the Milkweed Flagellate in Maryland.**—*Phytopathology*, xv, no. 5, pp. 294–296, 5 refs. Lancaster, Pa., May 1925. **Geographical Distribution of the Milkweed Flagellate,** *Herpetomonas elmassiani* **(Migone).**—*Ibid.*, pp. 297–299, 1 fig. **The Relation of** *Herpetomonas elmassiani* **(Migone) to its Plant and Insect Hosts.**—*Biol. Bull.*, xlix, no. 5, pp. 323–337, 5 figs., 5 refs. Wood's Hole, Mass., November 1925. Reprinted in : *Sch. Hyg. & Pub. Health Johns Hopkins Univ., Coll. Papers*, vii, nos. 29, 30 & 28. Baltimore, Md., June 1926. [Recd. January 1927.]

In the first of these papers the author states that he has found that *Herpetomonas elmassiani* is not pathogenic to *Asclepias syriaca* (milk-

weed) in Maryland, plants that have the flagellates in their latex being indistinguishable externally from those that have not. The flagellates occur almost entirely in fruiting plants.

H. elmassiani was described in 1916 from the latex of *Araujia angustifolia*, an Asclepiad, in Paraguay; a flagellate morphologically indistinguishable from it has since been found in the latex of *Asclepias syriaca* in Maryland and New Jersey and of *A. curassavica* in Honduras.

The distribution of the flagellates in the latex system of *A. syriaca* is discussed. All the available evidence points to the Lygaeid, *Oncopeltus fasciatus*, Dall., being the insect host of the flagellate in Maryland and New Jersey. This bug feeds on the latex from the flowers and pods of *A. syriaca*, and the anterior and dorsal lobes of its three-lobed thoracic salivary gland frequently contain large numbers of flagellates similar to *H. elmassiani*; flagellates do not, however, occur in the intestinal tract. Species of the genus *Oncopeltus* occur wherever *H. elmassiani* has been found in plant latex, but north of New Jersey it is replaced on *A. syriaca* by *Lygaeus*; specimens of *L. kalmii*, Stål, from *A. syriaca* in Massachusetts were examined for flagellates with negative results.

Peacock (W. H.). **Preventive Measures against Insect-borne Diseases.** —*Sierra Leone: Ann. Med. & Sanit. Rept. 1925*, pp. 15–18, 2 refs. Freetown, 1926. [Recd. January 1927.]

The usual anti-malarial measures were carried out during the year. A list of the Anopheline and other mosquitos of the Freetown district is given [*R.A.E.*, B, xiv, 63–65].

Ferguson (H. F.). **Mosquito and Malaria Control in Illinois.**—*Trans. Illinois State Acad. Sci.*, xvii (1924), pp. 279–293, 3 pls., 3 figs. Springfield, Ill., 1925. [Recd. January 1927.]

A popular account is given of the bionomics of mosquitos, the means of distinguishing Culicines from Anophelines, the part played by the latter in the dissemination of malaria, and the general measures adopted for their control. Details are given of a successful local campaign against mosquitos in Illinois.

de Barros Barreto (J.), de Almeida (E.) & de Almeida Mello (E. F.). **Lucta, em domicilio, contra os anophelineos adultos, especialmente pelos expurgos periodicos.** [Work in Dwellings against Adult Anophelines, especially by Means of Periodical Disinfestations.]—*Sciencia med.*, iv, no. 12, pp. 693–707, 2 figs. Rio de Janeiro, 31st December 1926.

After a survey of the literature dealing with work indoors against adult Anophelines, a description is given of experiments conducted in a village just south of Santa Cruz, Brazil, in a recognised malarial district. *Anopheles* (*Cellia*) *argyritarsis*, R.-D., is the predominant vector of the disease, others being *A. tarsimaculatus*, Goeldi, and *A. albimanus*, Wied. Twenty-eight tests were made, in each of which fumigation was effected by burning in pans a mixture of 20 parts sulphur and 1 part potassium nitrate, combustion being aided by the addition of a small quantity of spirit. At least two pans were used to a room, the important points being to divide the fumigant and to place the pans

close to the walls. The cost of this method is low and if practised periodically it is a useful preventive measure. In well-built dwellings not less than ½ oz. of sulphur per 35 cu. ft. space destroyed all mosquitos, but in badly constructed houses 2 oz. was necessary. In rooms with open windows and exit-holes purposely arranged in the roofs, ⅔ oz. caused 55 per cent. to escape and 37 per cent. to die, and left 8 per cent. alive. A squad of 8 men, working in couples, can fumigate 30 houses an hour.

SENIOR-WHITE (R.) & WILLIAMSON (K.). **The Future of Anti-malarial Research.**—*Ind. Med. Gaz.*, lxii, no. 1, pp. 38–47. Calcutta, January 1927.

The authors point out that it is only by protracted and intensive research that it can be hoped to find means of controlling and ultimately eradicating malaria, except in restricted regions, as the present methods of mosquito destruction and prophylaxis are far too costly for any but limited application. They then discuss some of the directions in which research is most needed, laying particular stress on the microbiological and bio-chemical investigation of the waters inhabited by mosquito larvae, and outline a scheme for co-ordinated research by specialists in the branches of science concerned.

HACKER (H. P.). **How Oil kills Anopheline Larvae.**—*F.M.S. Malaria Bur. Repts.*, iii, 62 pp., 2 pls., 1 diagr., 60 refs. London, 1925. [Recd. January 1927.]

Preliminary experiments confirmed the observations already noticed [*R.A.E.*, B, viii, 85] that Anopheline larvae are killed by contact with oil and that a complete film over the water is not necessary to destroy them. When larvae of *Anopheles vagus*, Dön., were placed in contact with a freshly prepared film of kerosene for about half a minute and then washed free from oil and placed in fresh water, the average length of survival was less than 8 minutes. Microscopical examination revealed the presence of oil in their breathing tubes. In some of the dead larvae the presence of small globules of oil in the vessels leading to the head without other evidence of oil in the tubes suggests that death may have been caused by the presence of oil in the neighbourhood of the nerve ganglia. Larvae injected with olive oil, which is not poisonous, survived for a considerably longer period, so that the effect of toxic substances in the oils must also be taken into consideration, more especially as many of the larvae showed oil in the stomach.

In the same way that water is unable to enter a capillary tube lined with wax, although paraffin oils do so readily, it is unable to enter the spiracles of larvae, although these are readily " wetted " by oil. Thus in natural conditions larvae are not drowned by water entering their breathing tubes. Other effects of this differential wetting are noticed in the depression which occurs around dry objects floating on the surface, and the heaping up of water around wet objects; this depression of surface water can be seen round floating larvae. The unevenness of the surface produces an unstable equilibrium, which results in neighbouring particles converging or diverging; two dry objects converge and two wet objects converge, but a wet and a dry object diverge. In the same way the dry spiracles of the larvae are attracted

to dry oil floating on the surface of the water. Larvae are heavier than water and sink after death, but are able to float on the surface owing to the dryness of their spiracles, just as a waxed needle will float. The horizontal position of Anopheline larvae is mainly due to the flat quadrangular surface of the spiracular apparatus. If, however, the spiracles are wetted with a weak solution of sodium oleate, the larvae are only able to stay at the surface by muscular movement and cannot rest there, so that they ultimately die exhausted with their spiracles full of soap solution. The use of soap as a larvicide would be expensive, but in some parts of the tropics a crude soap might be made on the spot and this method prove practicable. Differential wetting also explains the characteristic positions assumed by Anopheline larvae against the side of a dish. They rest at right angles to the wet edge of the dish because their tails are wet and are therefore attracted to the edge, while their dry spiracles are repelled. If the edge of the dish is lined with wax, the larvae lie parallel to the edge because their dry spiracles are attracted to it. The structures at the tip of the siphon of Culicine larvae are homologous with the spiracular apparatus of Anophelines, but the distribution of wet and dry areas is more symmetrical and there is no projection of the wet posterior extremity, so that the larvae are neither attracted nor repelled by the edge of the dish and lie scattered over the surface. If the wetness of the tip of the siphon is increased by placing them in a 0·01 per cent. solution of sodium oleate, they are attracted to the wet edge of the dish in the same way as Anophelines. The geometrical patterns assumed by the eggs of Anophelines when floating on water is also explained by their relatively wetter tail ends being attracted, and the dryer parts being attracted to other dryer parts. If they are wetted by immersion in soap solution they still float, but cling together in masses and no longer exhibit geometrical patterns.

The horizontal position of Anopheline larvae and their attraction to the edge enable them to escape the notice of fish to a greater extent than Culicine larvae, which hang down; also by differential wetting the head of Anophelines is placed in the best position for obtaining food and the tails hairs in the best position for grappling by means of their hooklets for support.

Experiments carried out with oil emulsion showed that larvae placed in momentary contact with freshly prepared emulsions were killed more quickly than those similarly exposed to emulsions prepared some time before or to emulsions that had been shaken repeatedly, and the results indicated that the loss of activity in the oil was not due directly to contact of the oil with the water, but to the fact that the globules of oil in an emulsion appear to become wet and are therefore unable to enter the spiracles. Thus contact with a perfect emulsion does not kill larvae. The greater activity of the freshly prepared emulsion was probably due to the presence of a residual film, which had become emulsified in the mixture shaken repeatedly. Experiments have shown that films of oil become less active the longer they remain on the water, and it is probable that the lower layer becomes wet or emulsified and does not therefore attract the spiracles of the larvae nor enter the tubes. These results do not conflict with those of other authors who state that the action of oil emulsions is better than oil films, because they dealt with larvae left in contact with the emulsion and were not merely concerned with the effect of momentary contact with oil, or in other words, the power of oil to enter the breathing tubes.

Water is unable to extract by ordinary means sufficient toxic material from crude oil to kill larvae. The solution of toxic material cannot therefore be an explanation of the action of incomplete films of oil, nor can it be the cause of oil losing its power to kill larvae. The small quantity of water found in the bottom of crude oil tanks and drums was, however, found to be toxic; but the fact that some of the larvae placed in this material until there was no response to stimuli recovered when placed in fresh water, proves that death was not due to globules of oil that had escaped filtration, but to some poisonous material. Experiment proved this material to be organic in nature.

Larvae exposed to the vapours of kerosene or petrol lost their reactivity to stimuli, the petrol vapour being the more active. The residue of these two oils after evaporation was less active than the original samples, but regained activity if kept in a stoppered bottle, the petrol becoming even more active than the original sample. This recovery of activity was proved to be due to oxidation. That the effect of exposure to these vapours was anaesthetic was proved by the fact that most of the larvae that had quite lost their reactivity recovered when removed from the vapours and placed with their spiracles in contact with the air but usually died when kept under water. The vapour of crude oil is inactive, but fractional distillates tested showed that the first 10 per cent. is about as active as kerosene, the 2nd, 3rd and 4th fractions are slightly active, and the rest can be regarded as giving no vapour. Larvae were similarly able to recover from the effects of the substances extracted from crude oil by water, and these substances are not volatile, since the solution can be heated to 100° C. [212° F.] without altering its effect on larvae. Thus oils exposed to evaporation on the surface of the water will lose part of their effect on larvae, and this is a reason in favour of using small quantities of fresh oil at frequent intervals.

Water has an affinity for active groups in substances, and oils, that spread, contain substances that have active groups; these substances have an affinity for oil on the one hand and for water by means of their active groups on the other. If the oil contains too much active material, the excess leaves the oil, satisfies the affinity of the water for active groups and thus prevents the oil from spreading. On the other hand pure saturated hydrocarbons do not spread, as they contain no substances having an active group. Active material must be present in the oil, but must not exceed the amount which the oil can retain in spite of the attraction of water. Crude oil is a satisfactory mixture because it contains no excess. A method of testing whether too much active material has been added to or is contained in an oil, is by shaking up a sample with water; if this water then prevents the spread of oil, it has been inactivated by the excess of active material. Substances that cause spreading are increased by oxidation.

Methods of comparing the spreading power of oils have been suggested. One of these depends on the amount of oil that must be added to a pure saturated hydrocarbon to make the mixture spread. The other is based on the extent to which inactivated water must be diluted with fresh water before the oil can spread. The material used for inactivating water is thymol, and the idea underlying the test is that an active oil will spread on a stronger solution of inactivated water than a weak oil.

Pure hydrocarbons are able to wet the spiracles and can therefore enter the breathing tubes to kill larvae. Volatile hydrocarbons

condense as a film on the lining of the breathing tubes and produce a pseudo-anaesthetic effect. This film increases the absorption of alcohols and thereby enhances their toxic action, which is true anaesthesia.

The toxicity of kerosene is increased by oxidation in the same way as the spreading power, so that these properties are probably due to the same substances.

EDWARDS (F. W.). **Una revisione delle zanzare delle regioni paleartiche.** [A Revision of the Mosquitos of the Palaearctic Region.]—*Riv. Malariologia*, v, N.S. i, nos. 3–6, pp. 253–285, 392–466, 613–652, 18 figs., 44 refs. Rome, 1926. (With Summaries in French and English.) [Recd. February 1927.]

This is a translation by Dr. G. Raffaele of a paper by Edwards [*R.A.E.*, B, x, 17] as revised by the latter. The species dealt with include: *Anopheles sacharovi*, Favr (*elutus*, Edw.); *A. lindesayi*, Giles (*japonicus*, Yam.); *A. edwardsi*, Yam., which is not regarded as a synonym of *A. gigas*, Giles [*cf. R.A.E.*, B, xv, 26]; *A. koreicus*, Yam. & Wat. (*punctibasis*, Edw.); *A. sineroides*, Yam., which is distinct from both *A. hyrcanus*, Pall., and *A. koreicus* and intermediate between them; *A. hyrcanus* (*pseudopictus* var. *flerowi*, Portch.); *Aëdes caspius*, Pall. (*albineus*, Séguy); *A. mariae*, Serg. (*desbansi*, Séguy); *A. sticticus*, Mg. (*hirsuteron*, Theo.); *A. punctor* var. *meigenanus*, Dyar (*Culex wahlgreni*, Theo.); *A. nearcticus*, Dyar (*parvulus*, Edw.), which is distinct from *A. alpinus*, L.; *C. modestus*, Fic. (*eadithae*, Barraud); *C. kirkpatricki*, n. n. for *C. adairi*, Kirkp.; *C. vagans*, Wied. (*tipuliformis*, Theo., *virgatipes*, Edw., *exilis*, Dyar); and *C. univitattus*, Theo. (*perexiguus*, Theo.). *Anopheles pulcherrimus* var. *atropotenae*, Lindtrop, *A. superpictus* var. *vassilievi*, Portch., and *A. turkhudi* var. *persicus*, Edw., are not considered to have varietal rank. Three varieties of *Aëdes pulchritarsis*, Rond., are recognised, *viz.*, *praeteritus*, Séguy, *berlandi*, Séguy, and *asiaticus*, n., no locality for the last being given. *Culex apicalis* var. *judaicus*, n., is described from Palestine. The subgenus *Aëdimorphus* is now considered to include *Ecculex*.

FALLERONI (D.). **Fauna anofelica italiana e suo "habitat" (paludi, risaie, canali). Metodi di lotta contro la malaria.** [The Italian Anopheline Fauna and its Habitat (Marshes, Rice-fields, Canals). Methods of Work against Malaria.]—*Riv. Malariologia*, v, N.S. i, no. 5–6, pp. 553–593, 1 pl., 23 refs. Rome, September–December 1926. (With Summaries in French and English.) [Recd. February 1927.]

The author considers that the only measures against malaria likely to be successful in Italy are those directed against the Anopheline vectors, of which *Anopheles maculipennis*, Mg. (*claviger*, auct.) is the chief. There are four forms of this species: with black eggs, with grey eggs, with eggs having two black bands [*R.A.E.*, B, xiv, 16], and with eggs without floats or with small floats, the last form being *A. sacharovi*, Favr (*elutus*, Edw.). These forms are discussed. *A. sacharovi* is also characterised by the eggs being of a uniform grey without dark spots. It is paludal and domestic, feeds in stalls and pigsties, and hibernates in the adult stage. It is very prolific, one

female having deposited 856 eggs in 5 batches. The form of *A. maculipennis* with black eggs is here called var. *messeae*, n., and that with grey eggs, var. *labranchiae*, n.

A comparison is made between the local distribution of malaria and that of the Anophelines. The Anopheline fauna of the rice-fields and that of the marshes are the same, being represented chiefly by *A. maculipennis* var. *messeae* (which also breeds in streams and drainage canals) and by *A. hyrcanus* var. *pseudopictus*, Grassi. Though the rice-fields of North Italy have the same fauna as those of the Pontine marshes, they are almost free from malaria. The former are in districts drained and reclaimed for agriculture, which is not the case in the Pontine Marshes. Malaria does not occur in the former because of the presence of numerous stabled domestic animals, which form centres of attraction for *A. maculipennis*. In the latter, stabled animals are absent, and *A. maculipennis* enters dwellings and attacks man. Efforts should be made to obtain protection by domestic animals wherever possible ; this could be done, even in an unreclaimed area where stalled domestic animals are absent, by keeping pigs.

Barducci (A. V.). **Lo sviluppo dei gameti di individui chininizzati nella zanzara trasmettrice.** [The Development in the Mosquito Vector of Gametes from Individuals treated with Quinine.]—*Riv. Malariologia*, v, N.S. i, no. 5–6, pp. 594–612, 15 refs. Rome, September–December 1926. (With Summaries in French and English.) [Recd. February 1927.]

In experiments in which *Anopheles maculipennis*, Mg. (*claviger*, auct.) was fed on cases of all three types of malaria at a more or less long interval after the administration of quinine, the sexual cycle of the *Plasmodium* did not occur, or was very incomplete. If young oocysts occurred they were small and rapidly degenerated. In these experiments at least, the influence of quinine on the malarial parasite is indisputable. The parasite is weakened and almost certainly cannot complete its cycle in the mosquito.

Sepulcri (P.). **La scardola comune (varietà piccola) nella lotta antimalarica.** [The small Variety of *Leuciscus erythrophthalmus* in antimalarial Work.]—*Riv. Malariologia*, v, N.S. i, no. 5–6, pp. 663–675, 5 figs. Rome, September–December 1926. (With Summaries in French and English.) [Recd. February 1927.]

As a result of experiments the author is able to confirm the value against mosquito larvae of *Leuciscus erythrophthalmus*, a fish that occurs naturally in North Italy and indeed throughout Europe [*R.A.E.*, B, xiv, 176]. In a number of tests it destroyed much larger numbers of larvae than the top-minnow, *Gambusia affinis*, and has the advantage of being able to withstand low winter temperatures.

Lischetti (A. B.). [**The Poisoning of Adult Anophelines.**]—*Soc. Argentina de Patol. Regional del Norte ; Segunda Reunión realizada en Salta, 1926*, pp. 228–242. (Abstract in *Riv. Malariologia*, v, N.S. i, no. 5–6, p. 726. Rome, September–December 1926.) [Recd. February 1927.]

Experiments with poison-baits against adult Anophelines have been made in Argentina, the material used being honey mixed with mercury

bichloride, boric acid, arsenious anhydride, potassium arsenate, potassium arsenite or potassium cyanide. Potassium arsenite proved the most satisfactory, as potassium cyanide, though the most active, soon loses its toxicity.

SEPULCRI (P.). **Fauna anofelica del basso Piave.** [Anopheline Fauna of the Lower Piave.]—*Riv. Malariologia*, v, N.S. i, no. 5–6, pp. 758–759. Rome, September–December 1926. [Recd. February 1927.]

Anopheles algeriensis, Theo., and *A. sacharovi*, Favr (*elutus*, Edw.) are recorded from the Lower Piave. *A. algeriensis* was taken chiefly in cattle sheds and pigsties, very rarely in dwellings, where those taken did not contain blood. *A. sacharovi* was found both in dwellings and in cattle sheds, and was always engorged. It was much more common than *A. algeriensis*. Neither species was found to be infected with malaria.

MARTINI (E.). **Zur Arsentechnik der Anopheleslarvenbekämpfung.** [The Technique of the Employment of Arsenic against Anopheline Larvae.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 2, pp. 53–57. Leipzig, February 1927.

A fuller account [*cf. R.A.E.*, B, xv, 61] is given of experiments made in Anatolia with the method described by Hackett [*R.A.E.*, B, xiv, 17] of dusting water-surfaces with a mixture of Paris green ($3\ CuHAsO_3 + Cu\ (C_2H_3O_2)_2$), which is stated to be the compound correctly known in Europe as Schweinfurth green. Hackett's instructions were closely followed. The arsenical must be kept dry; material stored in a cellar proved incapable of perfect admixture until dried over calcium chloride. Hackett's results were confirmed in all respects, both against larvae of the type of *Anopheles maculipennis*, Mg., and against those of *A. superpictus*, Grassi.

DE ROOK (H.). **Parijsch groen als Anopheleslarven-doodend middel.** [Paris Green as an Insecticide for Anopheline Larvae.]—103 pp., 12 figs., 3 maps, 46 refs. Amsterdam, Universiteitsboekhandel, 1927.

This thesis opens with an account of the development of the use as a larvicide for Anophelines of the arsenical compound known as Paris green in America, but usually called Schweinfurth green in Europe. It is a double salt of copper acetate and copper arsenite with the formula $Cu\ (C_2H_3O_2)_2 + 3\ CuHAsO_3$. A report is given of the author's observations in a locality in Sardinia, where *Anopheles maculipennis* is the carrier of malaria and only a few larvae of *A. bifurcatus* and *A. algeriensis* were found, no adults of these two species being noticed in dwellings and animal quarters. The anti-mosquito work consists exclusively of dusting with a mixture of Paris green and road dust at intervals not exceeding 14 days between 1st March and 1st November. All breeding-places within a radius of about 2 miles are treated. The reduction in malaria cases and the marked fall of the parasite index are probably due to this work.

In laboratory experiments in Holland in August and September in 1926 a mixture containing 10 cc. of Paris green in 1 litre of magnesia (magnesium oxide) was used ; road dust proved quite unsuitable as a carrier. Ten cubic centimetres of this mixture (containing 1 per cent. of Paris green) to a square metre of water-surface killed 99·3 per cent. of the larvae. The presence of duck-weed and *Enteromorpha* did not hinder its action. Half the amount of mixture produced a mortality of 98 per cent. ; with fine ash as a carrier, a mortality of 96 per cent. was obtained in 24 hours. With magnesia the highest mortality occurred within 4 hours. Paris green does not kill the pupae. When larvae are placed in water treated 24 hours previously, 25 per cent. die, or 44 per cent. if the water contains duck-weed.

Field experiments were made on land jutting out into the Zuider Zee, where the land side is intersected by numerous dykes, nearly all of which are breeding-places of Anophelines, and malaria is prevalent. The following conclusions were reached : Paris green at the rate of 10 cc. of a dust containing 1 per cent. of the poison to a square metre of water-surface is a powerful larvicide. If vertical vegetation (such as reeds) is present, especially after rain, or if there is a strong wind, the amount of dust must be increased to 20–30 cc. Horizontal vegetation does not hamper the toxic effect. The Paris green must have a 50 per cent. content of arsenious oxide (As_2O_3). The poison does not spread like oil, which renders its use advantageous in the case of wide dykes or expanses of water where vegetation and Anopheline larvae occur only at the edges, and for flowing water. Dusting must, however, be repeated every 15 days in Holland, and probably every 10 days in the Tropics. To dust a given place takes from four to five times as long as oiling. The cost of this method is a labour cost and does not depend on the cost of the poison. As the water is not rendered unattractive to adult mosquitos, Paris green is also suitable for trap breeding-places.

Brug (S. L.). **Aanteekeningen omtrent Muskieten (III).** [Notes on Mosquitos (III).]—*Geneesk. Tijdschr. Ned.-Indië*, lxv, no. 5, pp. 661–671, 7 figs., 9 refs. Batavia, 1925. [Recd. February 1927.]

The author discusses the synonymy of certain Anophelines. He considers *Anopheles pallidus*, Swell., to be a variety of *A. barbirostris*, Wulp, and treats *A. bancrofti*, Giles, var. *pseudobarbirostris*, Ludl., as a distinct variety ; the distribution of these mosquitos in the Dutch East Indies is given.

New localities where other mosquitos have been found are listed, and the variation in the colouring of the abdominal tergites in various Culicines is discussed.

Rodenwaldt (E.). **Entomologische Notities IV.**—*Geneesk. Tijdschr. Ned.-Indië*, lxvi, no. 6, pp. 787–799, 3 figs. Batavia, 1926.

The distribution of Anophelines collected in various parts of the Dutch East Indies is given in a table supplemented by notes.

The following records are from the Lesser Sunda Islands : *Anopheles vagus*, Dön., *A. subpictus*, Grassi (*rossi*, Giles) and *A. barbirostris*, Wulp, occurred in rice-fields and marsh-lands in Lombok about 1¼ miles from the coast. *A. ludlowi*, Theo., on the coast of Sumbawa is associated

with brackish water fish-ponds ; it was not observed in previous years when the ponds were closed to the tides. *A. aconitus*, Dön. (divergent form), *A. vagus* and *A. barbirostris*, which occurred in numbers indoors, were taken in the malarial interior of Sumba.

In one locality in Sumatra, as a result of drought, pools of brackish water were formed behind a sea-wall ; *A. ludlowi*, previously unknown in the locality, appeared and gave rise to malaria, but was controlled by oiling.

In Celebes *A. parangensis*, Ludl., was abundant in houses. In Borneo *A. umbrosus*, Theo., was the species chiefly taken ; *A. hyrcanus* var. *sinensis*, Wied., and *A. aitkeni*, James, were also observed.

An investigation was made of the Anophelines in a district of Java at an altitude of about 2,600 ft. Malaria was non-existent there twenty years ago when no estates had been laid out, but is now very prevalent. The dwellings are along sunny streams in the rubber plantations. *A. maculatus*, Theo., predominates in the streams and adjacent pools ; *A. aconitus*, *A. barbirostris*, *A. vagus* and *A. aitkeni* occur in small numbers. The Anopheline fauna changes completely on passing into the virgin forest. Not a single larva of *A. maculatus* or *A. aconitus* was taken, while those of *A. barbirostris* became very rare. In the streams in the forest their place is taken by *A. aitkeni*. *A. aconitus* and *A. maculatus* must be held responsible for the malaria, particularly the latter. This occurrence of *A. maculatus* in sunny streams and its absence in shade were also observed in the island of Nias.

The author does not consider *A. kochi*, Dön., to be so important a vector of malaria as *A. maculatus* ; *A. subpictus* is probably a carrier in Celebes.

Studies of *A. ludlowi* in fish-ponds on the west coast of Sumatra at altitudes up to about 2,100 ft. point to this species being an important carrier of malaria in that region.

A. aitkeni var. *palmata*, n., is described from larvae from western Java. These larvae, which gave rise to typical adults, were taken in shallow gently flowing water in deep shade in the virgin forest ; numerous typical larvae were also present.

STANTON (A. T.). **Notes on Malayan Culicidae.**—*Studies Inst. Med. Res. Kuala Lumpur, F.M.S.*, no. 20, viii + 94 pp., 44 figs. London, J. Bale, Sons & Danielsson, Ltd., 1926.

These nine papers, now reprinted with additional illustrations, have been noticed from their original sources [*R.A.E.*, B, i, 33, 229 ; iii, 10, 117, 228 ; iv, 23 ; v, 54 ; viii, 113], with the exception of no. 8—" Records of malaria infection in Malayan *Anopheles* " (pp. 61–63) reprinted from *Rept. Malaria Advisory Bd. F.M.S.*, 1918, in which the author gives the results of observations by various workers, showing that the Malayan Anophelines that have been infected under natural conditions are : *A. aconitus*, Dön., *A. fuliginosus*, Giles, *A. ludlowi*, Theo., *A. maculatus*, Theo., *A. hyrcanus* var. *sinensis*, Wied., and *A. umbrosus*, Theo., and that the following, in addition to the above, have been infected experimentally : *A. barbirostris*, Wulp, *A. karwari*, James, *A. kochi*, Dön., *A. subpictus*, Grassi (*rossi*, Giles) and *A. vagus*, Dön. (*rossi* var. *indefinitus*, Ludl.).

HOFFMANN (W. H.). **Hygienische Betrachtungen über das Gelbfieber in Afrika.** [Hygienic Considerations on Yellow Fever in Africa.] —*Münchener med. Wochenschr.*, 1926, no. 50, pp. 2116–2117. Munich, 1926. [Recd. February 1927.]

In America the control of yellow fever by measures against *Aëdes argenteus*, Poir. (*calopus*, Mg.) has been completely successful. In 1925 only three cases were found ; these occurred in Brazil. In Africa yellow fever is now suspected of being endemic throughout the whole coast of Guinea and the extent of its incidence inland is not known.

MOHLER (J. R.). **Report [1925–26] of the Chief of the Bureau of Animal Industry.**—*U.S. Dept. Agric.*, 43 pp. Washington, D.C., 1926. [Recd. January 1927.]

Further progress in tick eradication in the Southern States for the suppression of Texas fever in cattle [*R.A.E.*, B, xiv, 42] has enabled 19 additional counties to be released from quarantine, while ticks have been completely eradicated from 72 additional counties that had been released from quarantine but in which slight infestation remained. From June 1926 to 1st May 1928 cattle from the quarantined area may be transported inter-state for immediate slaughter after one dipping, but after the latter date only tick-free cattle will be allowed to be moved inter-state for any purpose.

HUSAIN (M. A.). **Pathological Entomology.**—*Sci. Repts. Agric. Res. Inst. Pusa, 1925–26*, pp. 76–77. Calcutta, 1926. [Recd. February 1927.]

Further experiments on the transmission of rinderpest were carried out by S. K. Sen [*R.A.E.*, B, xiv, 180 ; xv, 43] with the tick, *Boophilus annulatus australis*, Fuller. Ticks removed from experimentally infected bulls were crushed in normal saline solution, and the emulsion was injected intravenously into healthy animals. The possibility of hereditary transmission was tested by injecting saline emulsion containing the crushed eggs of infected ticks. In a few cases ticks from experimentally infected bulls were transferred to healthy animals. In all cases the results were negative.

Flies became very numerous in the dairy at Pusa during April, but wer effectively reduced by means of fly-papers prepared in the following anner : 1 part by weight of molasses was added to 1 part by weight of resin previously boiled with an equal quantity of castor oil, and the resulting mixture was painted on thick paper.

SERGENT (Ed.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). **Sur la virulence du sang dans la theilériose sud-africaine, à** *Theileria parva*.—*C.R. Acad. Sci. France*, clxxxiii, no. 26, pp. 1362–1364. Paris, 1926.

The authors obtained from South Africa numbers of *Rhipicephalus appendiculatus*, infected with *Theileria parva* [the causal organism of African coast fever], and placed them on thirteen cattle in Algiers, all of which died. Of a number of other cattle, some were successfully infected by injection of tissue of the organs or of the blood of these animals. That the resulting infection was due to *T. parva* was demonstrated by microscopic inspection.

Ticks infected with *T. parva* placed on one of these animals 40 days after the end of the attack did not infect it, while ticks of the same stock caused a fatal infection to two controls, one of which had been cured two months earlier of the North African form of the disease (*T. dispar*). Similarly infection by the *T. dispar* does not immunise against *T. parva*. Thus, contrary to general belief, *T. parva*, like *T. dispar*, is easily transmissible by blood inoculation.

Tick Paralysis in Pigs.—*Queensland Agric. Jl.*, xxvi, pt. 6, pp. 550–551. Brisbane, 1st December 1926.

A brief account is given of the symptoms and treatment of tick paralysis in pigs, caused by *Ixodes holocyclus*, Neum. Ticks when found attached to the animal should not be removed by pulling, but should be cut off with a razor or pair of scissors, close to the skin ; the place in which the mouth-parts are embedded should then be rubbed with antiseptic ointment, kerosene, or Stockholm tar.

Legg (J.). **Can the Cattle Tick** *Haemaphysalis bispinosa* **act as the Carrier of Piroplasmosis** (*Piroplasma bigeminum*)**? An Experimental Enquiry.**—*Australian Jl. Exptl. Biol. & Med. Sci.*, iii, pt. 4, pp. 203–216. Adelaide, 16th December 1926.

Haemaphysalis bispinosa, Neum., is widespread over part of the North Island of New Zealand [*R.A.E.*, B, x, 114]. Experiments were undertaken in Queensland in order to ascertain whether this tick would be capable of acting as an intermediary agent in the transmission of *Piroplasma bigeminum* in the event of infective cattle being introduced from areas in Australia that are infested with *Boophilus* (*Margaropus*) *annulatus australis*, Fuller. The life-cycle of *H. bispinosa* under artificial conditions in Queensland is somewhat longer than that of *B. annulatus*, and it must be much longer under natural conditions as the former is a three host tick.

The technique employed in the experiments is described. *H. bispinosa* was fed on a recently immunised animal, the infectivity of which was proved as frequently as possible by inoculation of susceptible animals. All stages of the tick were fed on the infective animal, and after they had moulted, the various stages, as well as all stages of the following generation, were placed on susceptible cattle, but failed to convey the disease, though the same animals subsequently reacted to inoculation with virulent blood. The experiments indicate that there is no possibility of *H. bispinosa* acting as an intermediary in the spread of bovine piroplasmosis.

Fielding (J. W.). **Preliminary Note on the Transmission of the Eye Worm of Australian Poultry.**—*Australian Jl. Exptl. Biol. & Med. Sci.*, iii, pt. 4, pp. 225–232, 1 pl., 13 refs. Adelaide, 16th December 1926.

A number of Arthropods were examined in order to determine whether they were concerned in the transmission of the eye worm of Australian poultry, which the author calls *Oxyspirura parvovum*, but which may prove to be a synonym of *O. mansoni*, which has also been recorded from Australia. *Argas persicus*, Oken (fowl tick), *Menopon* sp. (fowl louse), *Sarcophaga* sp., *Musca domestica*, L., *Stomoxys calcitrans*, L.,

Dermanyssus gallinae, DeG., *Nemobius* sp., *Periplaneta australasiae*, F., and *P. americana*, L., gave negative results, but the nymphs and adults of *Pycnoscelus* (*Leucophaea*) *surinamensis*, L., both contained filariform worms in the body cavity that resembled the immature stages of *O. parvovum*, together with numerous capsules containing larvae. A long series of this cockroach was then examined, and it was found that the larval forms contained no worms, the nymphs showed an infection of 38 per cent., and the adults of 93 per cent. The average number of worms found in each was 21, though in one case as many as 108 worms and capsules were obtained. Young uninfected birds fed on these cockroaches or on worms obtained from them were successfully infected.

Apparently the embryonic stage of the parasite is passed partly in the parent worm, partly in the alimentary tract of the bird and partly on the ground. The cockroach ingests the young larvae from droppings, and they pass through the wall of the alimentary tract, on the outside of which they encyst. Development takes place in the capsules, and the worms on reaching the infective stage leave the capsule and wander about in the body cavities. The cockroach is then eaten by the bird and apparently does not pass further than the crop before the worms escape, pass up the oesophagus to the mouth and eventually through the naso-lachrymal duct to the eye, where development is completed.

To get rid of eye worms, the cockroaches should be trapped (poisoning and fumigation are too dangerous to poultry), and the yard should be cleaned of all droppings and sprayed frequently with a good disinfectant. The poultry should then be treated, preferably by placing a few drops of turpentine in the eyes and half an hour later irrigating with lukewarm water or boracic water and removing the worms with a small camel hair brush. Weak potassium permanganate is also recommended, but results are obtained much more slowly. Kerosene is also said to give good results.

[Baranov (N.).] Baranoff (N.). **Ueber die serbischen Simuliiden.**—*N. Beitr. syst. Insektenk.*, iii, no. 19–20, pp. 183–194, 8 figs., 17 refs. Berlin, 31st December 1926. [Recd. February 1927.]

This paper comprises a key to and notes on twenty-three species and forms of Simuliids from all parts of Serbia except the high mountain region, with descriptions of a number of new forms of *Simulium* (*Wilhelmia*) *equinum*, L., *S.* (*W.*) *stylatum*, sp. n., *S. reptans*, L., *S.* (*Odagmia*) *ornatum*, Mg., *S.*(*O.*) *ruficorne*, sp. n., *S.*(*Nevermannia*) *aureum*, Fries, and *S.* (*N.*) *angustitarsis*, Lundstr. *S. columbaczense*, Schönb., which the author treats as a subspecies of *S. reptans*, is the only one that attacks domestic animals in north-eastern Serbia. Lysol is suggested for the destruction of the larvae in very small pieces of water.

Poisson (R.). **Un nouvel** *Herpetomonas* **coelomique :** *Herpetomonas mercieri* **n. sp., parasite de la cavité générale des larves de** *Simulium reptans* **L.**—*Arch. Zool. exptl. & gén.*, lxiv, no. 3, pp. 57–62, 2 figs., 15 refs. Paris, 30th October 1925.

Herpetomonas mercieri, sp. n., from the body-cavity of the larvae of *Simulium reptans*, L., is described.

Poisson (R.). **L'*Anisops producta*, Fieb. (Hémiptère, Notonectidae). Observations sur son anatomie et sa biologie.**—*Arch. Zool. exptl. & gén.*, lxv, no. 4, pp. 181–208, 17 figs., 53 refs. Paris, 30th March 1926.

The adults of *Anisops producta*, Fieb., which is widely distributed along the coasts of Europe, Asia and Africa, prey upon larvae of mosquitos, of which they destroy large numbers.

[Perfilev] Perfiljew (P. P.). **Zur Anatomie der Flohlarven.** [The Anatomy of Flea Larvae.]—*Zeitschr. Morph. u. Oekol. Tiere*, vii, no. 1–2, pp. 102–126, 18 figs., 11 refs. Berlin, 1926.

This is a detailed account of the anatomy of the larva of *Leptopsylla pectiniceps*, Wagn.

Christie (W.). **Fleas and Lice.**—*Jl. Dept. Agric. S. Australia*, xxx, no. 6, pp. 618–622. Adelaide, 15th January 1927.

This is a popular account of the bionomics and control of fleas and of the lice [*Pediculus* and *Phthirus*] that attack man.

Crawford (J. A.) & Chalam (B. S.). **Mosquito Reduction and Malarial Prevention. A Précis.**—8vo, xiv+102 pp., 23 figs., 2 diagrams, 16 refs. London, &c., Oxford Univ. Press, 1926. Price 4*s.* 6*d.*

This book is written for persons who have to undertake practical work against mosquitos and malaria, but are not in a position to make an exhaustive study of the subject.

A brief history of the disease is followed by an account of the life-cycle of the malarial parasites. The classification of mosquitos is discussed. The various stages of Culicines and Anophelines are compared, their bionomics are described, and a table showing the distribution and breeding habits of Indian Anophelines is given. The usual measures against malaria are reviewed, with details of the methods for the regular and systematic inspection and destruction of all likely mosquito breeding-places.

Covell (G.). **Report of an Inquiry into Malarial Conditions in the Andamans.**—8vo, 28 pp., 2 maps. Delhi, Govt. India Press, 1927.

The investigations forming the subject of this report were carried out during August and September 1926, and are chiefly concerned with malarial conditions in Port Blair, South Andaman. Brief visits were also paid to the forest settlements and camps in Middle and North Andaman. The findings of Christophers [*R.A.E.*, B, i, 51] have been confirmed in every respect, and where his recommendations, *viz.*, the removal of villages and convict stations in malarious positions to healthy sites, and the filling in of salt marshes wherever possible, have been carried out, the results have been strikingly successful. The essential for success in these measures is that they should be complete and permanent. The disease, of which all three forms occur, is very localised, and the author is convinced that *Anopheles ludlowi*, Theo., is the only malaria carrier in the Islands. *A. vagus*, Dön., *A. tessellatus*, Theo., *A. leucosphyrus*, Dön., *A. barbirostris*, Wulp, *A. aconitus*, Dön., *A. philippinensis*, Ludl., and *A. aitkeni*, James, also occurred, but those

taken in dwelling houses were in too small numbers to have any effect. *A. ludlowi* was found breeding in salt swamps or in their immediate vicinity, the ideal breeding-place apparently being a pool that is reached by very high tides but not by the daily tides. Larvae are only present in a very small percentage of the pools in any given swamp, owing to the activities of fish.

The distribution of malaria in the Islands follows closely that of *A. ludlowi*. The chief recommendations are the continuance of Christophers' measures, and it is suggested that whenever a new settlement is made, no village should be situated within $1\frac{1}{2}$ miles of a salt marsh or creek, as adults of *A. ludlowi* have never been found more than $1\frac{1}{4}$ miles from salt or brackish water.

HAKKI (I.). **Les moustiques d'Anatolie (Turquie).**—*Rev. Méd. & Hyg. trop.*, xix, no. 1, p. 8. Paris, January–February 1927.

A collection of mosquitos made in Anatolia from January to the end of November included the following Anophelines: *Anopheles maculipennis*, Mg., *A. superpictus*, Grassi, *A. gambiae*, Giles (*costalis*, Theo.), *A. bifurcatus*, L., *A. hyrcanus* var. *sinensis*, Wied., *A. plumbeus*, Hal., *A. multicolor*, Camb. (*chaudoyei*, Theo.), and *A. sacharovi*, Favr (*elutus*, Edw.). The Culicines included *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.).

LENERT (L. G.) & STUART (E.). **Report of Division of Malaria Control.**—*29th Bienn. Rept. California State Bd. Health, 1924–26*, pp. 82–85. Sacramento, Cal., 1926. [Recd. 1927.]

This is a brief summary of the activities of the Division of Malaria Control during 1924–1926 in the various counties of California. The work has consisted chiefly of surveys with a view to anti-malarial measures and the distribution of the fish, *Gambusia affinis*.

HOFFMANN (W. H.). **Die Gelbfiebergefahr im Mittelmeer.** [The Yellow Fever Danger in the Mediterranean.]—*Arch. ital. Scienze med. colon.*, vii, no. 9–10, pp. 173–176. Tripoli, September–October 1926. [Recd. March 1927.]

As yellow fever is endemic in Guinea and its vector, *Aëdes argenteus*, Poir. (*calopus*, Mg.), is easily carried by shipping, there is a possibility of the disease being introduced into ports on the Mediterranean. It is, therefore, desirable that data should be obtained on the distribution of *A. argenteus* on the Mediterranean coast.

TURBET (C. R.). **Report by the Government Veterinary Officer.**—*Fiji Dept. Agric. Ann. Rept., 1925*, pp. 9–11. Suva, 19th April 1926. [Recd. 1927.]

During a *post mortem* examination of a horse that had lived in Fiji for at least 8 years, an extensive infestation by larvae of *Oestrus* (*Gastrophilus*) *intestinalis* was found. This is believed to be the first record of Oestrid infestation in a horse in Fiji.

Thomson (J. G.) & Lucas (C. L. T.). **A Preliminary Note on the Study of *Endamoeba blattae* (Butschli, 1878) Leidy, 1879, found parasitic in the Intestine of *Blatta orientalis* in England, with some Remarks on its generic Status.**— *Jl. Trop. Med. & Hyg.*, xxix, no. 3, pp. 41–43, 1 pl., 26 refs. London, 1st February 1926.

In view of the fact that certain observers have regarded the genus *Entamoeba* (which includes the three species, *E. coli*, *E. histolytica* and *E. gingivalis*, that infest man) as identical with *Endamoeba*, the authors made a further study of *Endamoeba blattae*. The results show that the structural features of the cytoplasm and nucleus are sufficient grounds for separating it generically from *Entamoeba*.

Gay (D. M.) & Branch (A.). **Pulmonary Acariasis in Monkeys.**— *Amer. Jl. Trop. Med.*, vii, no. 1, pp. 49–55, 3 figs., 10 refs. Baltimore, Md., January 1927.

Twenty cases of infestation by mites of the lungs of monkeys (*Macacus rhesus*) imported into New York from Calcutta are recorded. The mites, which were apparently *Pneumonyssus foxi*, Weidman, caused a chronic benign infection, and were encapsulated in small subpleural vesicles close to bronchioles, suggesting that they originally entered the body by aspiration. The adult and larva of the mite are described, and references to other records of similar infestation in mammals, with a list of the mites concerned, are given. The authors found no evidence to suggest that the lesions caused by the mites had any connection with other pulmonary infections.

Pillers (A. W. N.). **The Louse of the Mouse.**— *Vet. Jl.*, lxxxiii, no. 3, pp. 154–155. London, March 1927.

In view of a statement in a recent paper by Compton [*R.A.E.*, B, xiv, 100] that he was not aware of any description of a louse on mice, the author points out that two species, *Hoplopleura acanthopus*, Burm., and *Polyplax serratus*, Burm., occur on these animals in Europe. From Compton's description of *Haematopinus muris* [*loc. cit.*] it is impossible to determine whether this louse is identical with either of the above species.

The Construction of Dipping Tanks for Cattle. Revised January 1927.— *Rhodesia Agric. Jl.*, xxiv, no. 1, pp. 63–82, 1 pl., 1 fig. Salisbury, January 1927.

This is a revision of two papers on the construction and management of dipping tanks that have already been noticed [*R.A.E.*, B, vii, 129].

Bevan (Ll. E. W.). **The Influence of Dipping in Solutions of Arsenic upon the Course of Trypanosomiasis.**—*Rhodesia Agric. Jl.*, xxiv, no. 2, pp. 163–190. Salisbury, February 1927.

This paper has already been noticed from another source [*R.A.E.*, B, xv, 46].

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MYERS (J. G.). **The Habits of** *Alysia manducator* **(Hym., Braconidae).**— *Bull. Ent. Res.*, xvii, pt. 3, pp. 219–229, 3 refs. London, March 1927.

Detailed observations on the habits of *Alysia manducator*, Panz., were made when rearing it as a parasite for Australasian sheep-maggots. The rate of parasitism varied considerably among maggots from different baits. The situation of the bait does not appear to influence this, but the parasites were noticeably attracted to small fresh carcases, probably because of a similar preference on the part of the flies of the genus *Lucilia*. Many species of Diptera are attacked, *Lucilia* being the preferred host, but when flies of this genus cease activity in the early autumn, species of *Calliphora* are chiefly attacked (*C. erythrocephala*, Mg., in particular). The fact that species of *Fannia* were successfully parasitised indicates a probability that *Alysia* will attack the spinous maggots of *Chrysomyia albiceps*, Wied. (*rufifacies*, Macq.), one of the Australian sheep-maggot flies that is now established in New Zealand. The Braconid does not attack larvae living in faecal matter, and few parasites were obtained from visceral offal, though whether this is due to a dislike of the medium or to the species of maggots infesting it was not determined.

It seems probable that suitable bait and perhaps a suitable part of it are located by an olfactory sense in the antennae, since the Braconid frequently arrives at a bait long before the maggots are large enough for oviposition, while the individual prey is discovered by touch through the agency of the palp-like organs of the ovipositor-sheath. One egg is deposited in each host, and the female continues ovipositing in one larva after another until its wings are rendered useless by the adhesion of the filth through which it burrows in search of its prey, its movements becoming slower and slower apparently from sheer fatigue. The effect of oviposition on the host larva is described in detail. The author is inclined to think that the paralysis following the insertion of the ovipositor is due to poison rather than nerve paralysis by direct mechanical action. After the departure of the Braconid the maggot almost invariably lies inert (with no perceptible beating of the heart) for a period varying from a few seconds to $2\frac{1}{2}$ minutes, though the heart may cease beating for as long as $14\frac{1}{2}$ minutes. Occasionally more than one egg is laid in a single host, but in such cases only one parasite emerges. Oviposition may occur through the skin and hair of a small mammal or even through a wriggling layer of day-old maggots covering larger larvae. *A. manducator* prefers full-fed larvae for oviposition, and although it is difficult to demonstrate the presence of the egg or larva of the parasite before the host pupates, yet 3 or 4 days after pupation, under September conditions, it is rare to find anything in the parasitised puparium but a full-grown Braconid larva. The process of pupation and method of emergence are described in detail.

The author has kept both sexes alive in glass-topped boxes with a split raisin and a constant supply of water either from wet blotting paper or a small vial with a stopper of water-logged elder pith from which the water could be imbibed. One male lived as long as 46 days while five females that were fertilised when they were a month old and allowed to oviposit lived between 40 and 43 days. It seems probable that the latter would live very much longer in cold weather without working. Mating takes place readily under the conditions described above. Reference is made to previous observations on the life-cycle of the

Braconid [*R.A.E.*, B, iv, 146; viii, 218]. In August and September the adults emerged about 41 days after oviposition.

BEZZI (M.). **Some Calliphoridae (Dipt.) from the South Pacific Islands and Australia.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 231–247, 6 refs. London, March 1927.

This revision is the result of recent studies of Calliphorids from Fiji, Samoa and other South Pacific Islands, as well as of specimens from New Zealand and Australia, taking into consideration the latest work of other authors. Notes are given on the distribution of the species discussed. Keys are given to the species of *Lucilia* and *Calliphora*, and one new genus, *Paurothrix*, and ten new species are described.

CAMERON (A. E.) & FULTON (J. S.). **A Local Outbreak of the Winter or Moose Tick, *Dermacentor albipictus*, Pack. (Ixodoidea) in Saskatchewan.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 249–257, 8 figs., 5 refs. London, March 1927.

In Saskatchewan there was a severe outbreak of *Dermacentor albipictus*, Pack. (moose-tick) during the winter of 1921–22. Many moose were found dead, apparently from loss of vitality due to severe infestation by this tick, and many horses and cattle were subsequently affected. No serious losses among domestic animals have occurred since this outbreak, which was probably due to a combination of circumstances. In the preceding years *D. albipictus* had been increasing on moose, which was fairly abundant in the district, with the result that the tick had become widely disseminated in the woods, while the practice of wintering horses and cattle in the woods rendered them liable to infestation by larval ticks emerging from the eggs deposited in the ground by the engorged females that had dropped from their hosts in the previous winter. Although *D. albipictus* is a single-host tick, it seems probable that adults and nymphs removed from one host as it rubs against trees and undergrowth will readily transfer to another if they should happen to come into contact with it. Outbreaks of this tick on domestic animals in the prairie provinces will probably be confined to the neighbourhood of virgin forest. When this is opened up, the native hosts of the tick will recede and thus reduce the liability of infestation.

The life-history of *D. albipictus* is similar to that already described [*R.A.E.*, B, i, 161; vii, 2]. Both males and females are long-lived and resist exposure to variable climatic conditions. Unfed and partly-fed adults were observed crawling actively among the hairs of moose hides three months after the animal had been killed. It is not improbable that in the open oviposition is considerably delayed in the case of females that drop from their hosts in mid-winter, and it is likely that egg-laying is undertaken most actively in spring and summer. The vitality of the larvae is remarkable, and they have been kept alive without food for 185 days in the laboratory, water alone being supplied. It is possible that larvae may attach themselves to their hosts as early as the end of September, although the earliest date on which they were discovered was 15th November. The first moult takes place about ten days later, and during the latter half of November and the greater part of December nymphs are more numerous than larvae or adults.

The adult stage is reached about two weeks after the first moult, and from January to the beginning of May the adults predominate. Mating occurs shortly after the second moult, and the females become fully engorged about ten days after their final attachment.

Live-stock in northern Saskatchewan may be allowed to graze at large throughout the forest ranges from the beginning of May, when the last ticks are dropping from their hosts, until the end of September, when the larvae become attached. They should then be rounded up and confined until the following May in tick-free pastures and barns after being thoroughly examined for ticks. Small infested herds may be sprayed with a hand-spraying machine, but dipping is more practicable and effective for large herds. To make a suitable dip 10 lb. finely powdered white arsenic (99 per cent. arsenic trioxide) and 25 lb. soda should be boiled together in not less than 25 gals. water for 15 minutes, or longer if necessary to effect complete solution of the arsenic ; this should be cooled to 140° F. with cold water after which 1 gal. pine tar should be added gradually while the solution is thoroughly stirred, and the whole should be diluted immediately with enough clear water to make 500 gals. One treatment is usually sufficient to rid an animal of larval and nymphal ticks, but a second is advised after an interval of 7 to 10 days. In northern Saskatchewan dipping cannot be carried out with safety after September. Infested animals should on no account be treated with mineral oils. Infested fields may be cleaned by spring ploughing after the ticks have dropped to the ground. The engorged females are buried, and even though the eggs may hatch, the larvae find difficulty in reaching the surface.

Singh Pruthi (H.). **The Influence of some Physical and Chemical Conditions of Water on May-fly Larvae** (*Cloëon dipterum*, **L.**).—*Bull. Ent. Res.*, xvii, pt. 3, pp. 279–284, 1 fig., 24 refs. London, March 1927.

Most investigations dealing with the influence of the physical and chemical conditions of water on the bionomics of aquatic insects have been concerned with mosquito larvae, the respiration of which is mostly independent of dissolved gases. The present observations were made with a view to determining the influence of these factors on the larvae of *Cloëon dipterum*, L., a true aquatic insect. The following are the author's conclusions and summary : Numerous experiments have been performed to study the specific effect of hydrogen-ion concentration, CO_2 and oxygen content of water on may-fly larvae, which warrant the following conclusions : While hydrogen-ion concentration is a factor of great significance, the carbon dioxide pressure is of greater importance and should afford a very reliable index to the suitability of water as a habitat for true aquatic insects. May-fly larvae, and presumably other insects as well, can stand a very low concentration of oxygen, below 1 cc. per litre. In view of the fact that in nature the oxygen content seldom goes down to such a low figure, insects should not, as a rule, die of lack of oxygen.

Ingram (A.). **New Fleas from South African Rodents.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 289–293, 4 figs. London, March 1927.

The following new fleas are described from Cape Province : *Chiastopsylla pitchfordi*, sp. n., from the nests of the water-rat, *Parotomys*

luteolus; *C. mulleri*, sp. n., and *C. mulleri* var. *longisetis*, n., from the nests of another water-rat, *Mystomys broomi*; and *Praopsylla powelli*, gen. et sp. n., from a golden rock mouse, *Praomys arborarius*.

FERGUSON (E. W.). **Tabanidae of the Samoan Islands.**—*Bull. Ent. Res.*, xvii, pt. 3, pp. 315–316. London, March 1927.

Tabanus samoensis, sp. n., is the first species of this family to be described from the Samoan Islands. The author discusses the distribution of the TABANIDAE in the Pacific Islands. They are not recorded from Tonga or islands to the eastward of Samoa, and thus represent a Papuo-Melanesian element in the Polynesian fauna.

MILLER (D.). **Parasitic Control of Sheep Maggot Flies.**—*N.Z. Jl. Agric.*, xxxiv, no. 1, pp. 1–4, 10 figs., 1 ref. Wellington, 20th January 1927.

Up to the present the parasite, *Mormoniella* (*Nasonia*) *brevicornis*, Ashm., which was liberated in New Zealand in 1922 [*R.A.E.*, B, x, 165] has had no effect upon the sheep-maggot flies, which are becoming more apparent in their attacks each year, especially in the north of the South Island. As *M. brevicornis* is a parasite of the pupae, it is very probable that under natural conditions a high proportion of parasitism cannot be obtained owing to the fact that the sheep-maggots burrow into the ground to pupate [*cf. R.A.E.*, B, x, 2]. It was therefore decided to import a parasite that would oviposit in the maggot before it entered the ground. Two consignments of parasitised blow-fly pupae have been received from England, from which ninety adults of *Alysia manducator*, Panz., have now been reared. Four blow-fly pupae parasitised by *Tachinaephagus australiensis*, Gir., have been received from Australia. Short notes are given on the bionomics of *A. manducator* [*R.A.E.*, B, viii, 218; xv, 82].

HOPKIRK (C. S. M.). **Cattle-ticks and Redwater. Experiments indicate the New Zealand Tick as Non-carrier of Piroplasmosis.**—*N.Z. Jl. Agric.*, xxxiv, no. 1, pp. 16–17. Wellington, 20th January 1927.

This is a brief account of an investigation already noticed [*R.A.E.*, B, xv, 77], indicating that *Haemaphysalis bispinosa*, Newm., cannot act as a vector of *Piroplasma bigeminum*.

ROUBAUD (E.). **Sur l'hibernation de quelques mouches communes.**—*Bull. Soc. ent. France*, 1927, no. 2, pp. 24–25, 2 refs. Paris, 1927.

The author records further experiments to determine the type of hibernation in certain flies [*cf. R.A.E.*, B, xi, 55]. *Calliphora erythrocephala*, Mg., and *Muscina stabulans*, Fall., proved to be homodynamic. Continuous production of generations of *C. erythrocephala* for a year was obtained at a temperature of 18–25° C. [64·4–77° F.], without any period of retarded development occurring; hibernation in this fly is dependent upon cold and may take place in the larval, pupal, or adult stages. Hibernating females of *M. stabulans* captured in the autumn usually had immature ovaries but laid eggs after being kept at a favourable temperature for several days, and reproduction

took place uninterruptedly, even in the winter, in a warm room. *Fannia canicularis*, L., *Phormia groenlandica*, Zett., and *Musca autumnalis*, DeG. (*corvina*, F.) proved to be heterodynamic. *F. canicularis*, like *Mydaea platyptera*, Zett., hibernates as a third stage larva, but has four generations a year, while *M. platyptera* has only two; each of the first three generations occupies 20–25 days in spring and summer, but in the third stage larva of the fourth generation a diapause occurs that is only terminated by prolonged cold or, more quickly, by dryness. In *P. groenlandica* and *M. autumnalis* hibernation resembles that of *Anopheles maculipennis*, Mg., and *Culex pipiens*, L. [*R.A.E.*, B, xi, 162–164], the hibernating forms being fertilised females in which ovarian activity is suspended for several months, whether they feed or not. Other common flies, such as *Pollenia rudis*, F., that live in the open during the summer but enter houses, as fertilised females, for hibernation, all seem to follow the same rule of suspended ovarian activity.

Kröber (O.). **Die Chrysopsarten Afrikas.** [The African Species of *Chrysops*.]—*Zool. Jahrb.*, Abt. System., Oekol. & Geog. Tiere, liii, no. 1–3, pp. 175–268, 5 pls., 15 figs., numerous refs. Jena, 1927.

This revision of the African species and varieties of *Chrysops* includes *C. nigrobasalis*, sp. n., from East Africa.

Enderlein (G.). **Dipterologische Studien, xvii**[i].—*Konowia*, vi, no. i, pp. 50–56, 2 figs. Vienna, 22nd March 1927.

The author does not regard *Neotabanus*, Lutz 1914, of which *triangulum*, Wied., is the type, as distinct from *Tabanus*.

Aubertot (M.). **La flagellose des Euphorbes dans l'Est de la France.**—*Bull. Soc. Path. exot.*, xx, no. 1, pp. 14–19, 12 refs. Paris, 12th January 1927.

The author gives a résumé of his observations on flagellate infection in *Euphorbia*, made during the last few years in different localities of eastern France. The geographical extension of *Herpetomonas* (*Leptomonas*) *davidi* in this region is discussed. Insects known to be carriers of the disease in other countries were examined and found negative, but in one locality *Pyrrhocoris apterus*, taken in infected fields, harboured in almost every instance intestinal flagellates resembling *Crithidia*. The disease is evidently far more widespread than has been supposed, *H. davidi* being found in considerable abundance in each of the districts examined, and in every case foci of phytophagous Rhynchota, frequently harbouring flagellates, occurred in the vicinity. There are no outward signs of infection in the *Euphorbia* plants, but the latex of infected ones is generally very deficient in starch grains.

Borel (M.). **Descriptions de deux espèces nouvelles de Culicides de Cochinchine,** *Lophoceratomyia roubaudi* **et** *L. bernardi*, **n. sp.**—*Bull. Soc. Path. exot.*, xx, no. 1, pp. 25–30, 5 figs. Paris, 12th January 1927.

Descriptions are given of the adult male and female and larva of *Culex* (*Lophoceratomyia*) *roubaudi*, sp. n., taken with *C.* (*L.*) *minor*, Leic.,

in a forest east of Saigon, and resembling *C.* (*L.*) *fraudator*, Theo., with which it is compared, and of the adult male and larva of *C.* (*L.*) *bernardi*, sp. n., collected in October from a forest in the red soil region. This is considered intermediate between *C.* (*L.*) *uniformis*, Theo., and *C.* (*L.*) *mammifer*, Leic.

Schwetz [J.]. **La limite actuelle de la *Gl. morsitans* autour d'Elisabethville (Katanga) avec quelques considérations sur les causes du recul progressif de cette mouche.**—*Bull. Soc. Path. exot.*, xx, no. 1, pp. 78–87, 1 map, 1 ref. Paris, 12th January 1927.

In a former paper, Rodhain attributed the disappearance of *Glossina morsitans* in the neighbourhood of Elisabethville, Katanga, to the elimination of big game, itself a consequence of European occupation [*R.A.E.*, B, xiv, 107]. The author's personal observations in 1925 and 1926 bear out this theory. For years the utility of exterminating big game in the African colonies for the purpose of driving out the tsetse-fly has been a matter of dispute, and any conclusive experiment, carried out systematically on a large scale, has been impracticable and has had to be abandoned. The case of Elisabethville may be considered in the nature of an experiment lasting over many years. In 1912, trypanosomiasis was so general that it was almost impossible to keep cattle in the region, but not a single case of the disease was discovered during 1925–26. The disappearance of the fly has been slow and gradual, more so even than that of the game animals, and this, which has doubtless been the case elsewhere, explains why experiments of short duration have not been conclusive. The author previously held the theory that the relative occurrence of *G. morsitans* and *G. palpalis* depended entirely upon the presence of water and suitable vegetation, the great difference between these species being that the latter needs water and denser shade, but the experience of Elisabethville has led him to conclude that there is, besides these factors, some biological difference between them, *G. morsitans* having a greater dependence on big game than *G. palpalis*. So long as big game was present, *G. morsitans* attacked man and domestic animals also, but as soon as it was eliminated the fly was unable to maintain itself, in spite of the increased numbers of domestic animals and man available. Although it is obvious that the absence of game is the most important factor in the disappearance of *G. morsitans*, it would be interesting to discover whether there are other concomitant factors resulting from European occupation that are important to the fly.

The limits of occurrence of *Glossina* in the region of Elisabethville are shown on a map.

McCall (F. J.). [**Report of the Chief Veterinary Officer.**]—*Tanganyika Terr.: Ann. Rept. Dept. Vet. Sci. & Animal Husbandry, 1925*, pp. 1–23, 1 map. Dar-es-Salaam. [1927 ?]

Investigations on the distribution of tsetse-flies in Tanganyika Territory have been continued, and a revised map, on a larger scale than the one previously published [*R.A.E.*, B, xiii, 19] is appended to this report. It appears that tsetse-flies are spreading, and *Glossina swynnertoni*, Aust., has been recorded from many areas previously regarded as infested only by *G. morsitans*, Westw., and *G. pallidipes*, Aust. Preliminary investigations of the tsetse-flies in the Arusha

district have indicated that in one fly-belt *G. morsitans*, *G. swynnertoni*, *G. brevipalpis*, Newst., and *G. pallidipes*, are all present, while of the first three of these and *G. fuscipleuris*, Aust., each occurs alone in one belt.

It is becoming increasingly clear that many native cattle, sheep and goats are relatively tolerant to trypanosome infection, particularly to *Trypanosoma vivax*, and native cattle derived from tsetse-fly districts and their progeny are especially tolerant as compared with European cattle and, to a less extent, with grade stock. Cases of trypanosomiasis of cattle believed to have been mechanically transmitted by *Stomoxys* are recorded.

Hornby (H. E.). **Fourth Annual Report of the Veterinary Pathologist, Mpwapwa, for the Year ending 31st December, 1925.**—*Tanganyika Terr. : Ann. Rept. Dept. Vet. Sci. & Animal Husbandry, 1925*, pp. 24–36. Dar-es-Salaam. [1927 ?]

Young goats in the drier parts of Tanganyika Territory are sometimes severely infested by fleas, and often die as a result. Some goats were heavily infested by *Ctenocephalus canis*, Curt., which caused the death of a newly born kid. The infestation was eradicated by burning the bedding and dipping the adult animals in Cooper's dip, and the kids in dilute Jeyes' Fluid.

Curson (H. H.). **Does a Species of *Leishmania* occur in the Goat ?**—*11th & 12th Repts. Dir. Vet. Educ. & Res., Union S. Africa*, pt. 1, pp. 29–30, 1 pl., 2 refs. Pretoria, September 1926. [Recd. February 1927.]

A parasite obtained from the blood of an apparently healthy goat, used for artificial feeding of blood-sucking flies in Zululand, is described provisionally as *Leishmania caprae*, sp. n. No form of leishmaniasis had previously been recorded from Africa south of the Equator.

Cowdry (E. V.). **A Group of Micro-organisms transmitted hereditarily in Ticks and apparently unassociated with Disease.**—*11th & 12th Repts. Dir. Vet. Educ. & Res., Union S. Africa*, pt. 1, pp. 147–158, 3 pls., 12 refs. **Cytological Studies on Heartwater. I. The Observation of *Rickettsia ruminantium* in the Tissues of Infected Animals. II. *Rickettsia ruminantium* in the Tissues of Ticks capable of transmitting the Disease.**—*Ibid.*, pp. 161–196, 4 pls., 67 refs. Pretoria, September 1926. [Recd. February 1927.]

These papers have been noticed from another source [*R.A.E.*, B, xiv, 213].

Bedford (G. A. H.). **Report on the Transmission of Nagana in the Ntabanana and Mhlatuze Settlements, Zululand.**—*11th & 12th Repts. Dir. Vet. Educ. & Res., Union S. Africa*, pt. 1, pp. 275–300, 2 refs. Pretoria, September 1926. [Recd. February 1927.]

This is a report on an investigation carried out from October 1922 to May 1923 in the area in Zululand lying between the White Mfolosi River on the north and the Mhlatuze River on the south, separated from the

coast by a sugar-cane belt 15–20 miles wide, and bounded on the west by open highlands. The country is undulating, mostly lying from 300 to 900 feet above sea-level, and much of it is admirably suited for *Glossina*, Tabanids and other blood-sucking flies, the hills being mainly open grass-land and the valleys almost always carrying more or less dense bush. The greater part of the area, which covers about 300 square miles, was settled in 1919–1920, at which time it was believed to be free from trypanosomiasis and *Glossina*. In a short time, however, serious losses from trypanosomiasis occurred among the introduced cattle, and the fact that *G. pallidipes*, Aust., was still not known to occur further south than the game reserve bordering on the White Mfolosi River led to the suggestion that other blood-sucking flies were responsible for the transmission of the disease.

By the use of bait animals the author obtained *G. pallidipes* at each of the four points where systematic daily collecting of blood-sucking flies was carried out. This showed that the distribution of *G. pallidipes* coincided with that of trypanosomiasis, but the cases of the disease seemed to be out of proportion to the number of tsetse-flies present, as only 17 specimens were taken in the whole course of the investigation ; moreover none of the animals on which they were captured subsequently developed trypanosomiasis, although most of the flies were allowed to feed. The case for the mechanical transmission of the disease by Tabanids or *Stomoxys* was therefore strengthened, but, on the other hand, both trypanosomiasis and *G. pallidipes* were commonest nearest to the game reserve. Furthermore, Tabanids and *Stomoxys* are both widespread, whereas the distribution of both *G. pallidipes* and the disease is limited, as well as being apparently co-extensive.

Mechanical transmission of trypanosomiasis, if it takes place, must be due to flies being disturbed while sucking the blood of an infected animal and completing their feed on a healthy animal, and can therefore only occur over short distances. The flies that are most likely to act as mechanical transmitters are those that are readily dislodged by the tail or by stamping, such as *Stomoxys* and those Tabanids that confine their attacks mainly to the legs, but not such species as *Haematopota* (*Chrysozona*) *mactans*, Aust., and *Tabanus biguttatus*, Wied., which normally settle on the body, from which they are not readily dislodged.

G. pallidipes occurs in Zululand throughout the year, but is more numerous in summer than winter, when the flies are forced to confine themselves to small areas in order to obtain shade. *Stomoxys* and an undescribed species of *Bdellolarynx*, which were very common, are probably also found throughout the year, but Tabanids are present only in the summer. Trypanosomiasis is much more prevalent during the winter, but the animals usually only begin to show symptoms of the disease when the veldt is dry and they are unable to obtain sufficient nourishment, and in most cases it is impossible to state when they became infected. Most of the common Tabanids were present throughout the summer, appearing probably about the end of August or beginning of September and continuing until the end of April or beginning of May, and it was impossible to determine the number of broods. *Tabanus ustus*, Wlk., which was not seen after the beginning of November, and *Buplex brunnipennis*, Lw., which was not seen after the beginning of December, have only one brood, and *Corizoneura pallidipennis*, Ric., has two, being found from the end of October to 1st December and from the end of March to early May ; the second brood

of this Tabanid is the larger, probably because seasonal conditions are more favourable for the larvae. A list of the blood-sucking Diptera collected is given, with notes on the habits of some of the species.

Bedford (G. A. H.). **Check-list of the Muscidae and Oestridae which cause Myiasis in Man and Animals in South Africa.**—*11th & 12th Repts. Dir. Vet. Educ. & Res., Union S. Africa,* pt. 1, pp. 483–491, 14 refs. Pretoria, September 1926. [Recd. February 1927.]

This annotated list of flies that cause myiasis, either invariably or occasionally in South Africa, comprises 38 species; those recorded from man have been noticed previously [*R.A.E.*, B, xiii, 46].

Bedford (G. A. H.). **A Check-list and Host-list of the External Parasites found on South African Mammalia, Aves, and Reptilia.**—*11th & 12th Repts. Dir. Vet. Educ. & Res., Union S. Africa,* pt. 1, pp. 705–817, 97 refs. Pretoria, September 1926. [Recd. February 1927.]

This list, which is arranged by orders, is extensively annotated, and includes many keys to genera and species. Permanent parasites of migratory birds have been included whether recorded in South Africa or elsewhere (except America, as migration is usually north and south), but temporary parasites have only been included when recorded in South Africa. The host-list is divided into five parts, the first including man and domestic animals, the second domestic birds, and the other three South African mammals, birds and reptiles; the parasites occurring on each species are listed, and the order and family of each are indicated.

[Wagner (J.).] **Вагнер (J.). The Significance of Ectoparasites with Reference to the Phylogeny of their Hosts.** [*In Serbian.*]—*Acta Soc. ent. Serbo-Croato-Slovenae,* i, pt. 1, pp. 29–35. Belgrade, 1926. (With a Summary in German.) [Recd. March 1927.]

The author discusses the possibility of tracing the evolution of mammals, including man, by a study of their ectoparasites. Only fleas are dealt with.

Neukomm (A.). **Sur la structure des bactéroïdes des blattes** (*Blatella germanica*).—*C.R. Soc. Biol.*, xcvi, no. 5, pp. 306–308, 1 fig., 1 ref. Paris, 11th February 1927.

This is a discussion on the bacterioid bodies occurring in *Blattella germanica*, L., which are considered by some authors to be purely cellular products. Their structure is analogous to that of gram-positive bacteria and yeasts, and the author considers that they are true symbionts and should be classed among the bacteria and yeasts.

Lundblad (O.). **Zur Kenntnis der Flöhe. i-ii.** [Contribution to a Knowledge of Fleas. i-ii.]—*Zool. Anz.*, lxx, no. 1–2, pp. 7–26, 7 figs., 31 refs. Leipzig, 5th February 1927.

From observations on *Ceratophyllus gallinae*, Schr., the author found that the antennae in male fleas are used as claspers when pairing.

Stewart (M. A.). **A Means of Control of the European Hen Flea** (*Ceratophyllus gallinae,* **Schrank**).— *Jl. Econ. Ent.,* xx, no. 1, pp. 132–134. Geneva, N.Y., February 1927.

The following is the author's summary: This paper very briefly describes the control of the European hen flea (*Ceratophyllus gallinae,* Schr.), a potential pest of considerable economic importance to poultrymen, by spraying the buildings with Phinotas Disinfectant and dipping the birds in the same material.

Hirst (L. F.). **Researches on the Parasitology of Plague. Part I.**— *Ceylon Jl. Sci.,* Sect. D, Med. Sci., i, pt. 4, pp. 155–271, 1 pl., 2 figs., 2 charts, 4 pp. refs. Colombo, 18th December 1926. [Recd. March 1927.]

This is an elaboration of a paper already noticed on the relation of certain species of fleas to the spread of plague [*R.A.E.*, B, xiii, 193] and may be regarded as a resumé of the whole series of researches carried out at the City Microbiological Laboratory, Colombo, from 1912 to 1925.

Xenopsylla astia, Roths., was apparently unable to lay eggs when fed on human blood. The proportion of female fleas that laid eggs varied from 76·2 per cent. in the first quarter of 1924 to 43 per cent. in the last quarter, and the average number of eggs per flea varied from 3·1 to 1·3. The percentage of larvae hatching out to eggs laid varied from 71·6 to 48·7; of adults to larvae from 89·7 to 73·1; and of adults to eggs laid from 64·2 to 35·6. In each case the figures were larger for the first or cooler quarter of the year and at the minimum during the third quarter. The comparatively slight seasonal variation in the temperature and humidity produced almost as great an effect on flea bionomics as it did upon the incidence of plague. The comparative figures for the last three quarters of 1924 seem to indicate that the average conditions in Colombo are distinctly more unfavourable to *X. cheopis,* Roths., than to *X. astia. X. cheopis* was, however, successfully bred at all seasons of the year. The average length of the egg stage was 4·1 days for *X. astia,* and 4·7 days for *X. cheopis.* Pupation took place between the 10th and 13th day after oviposition, and the adults emerged 8–16 days later. The length of the life-cycle of *X. astia* from oviposition to emergence varied from 18–37 days, with an average of 25 days under ordinary conditions. In wild, unfed fleas of both species the mean longevity of the female was much greater than that of the male, but all were influenced by climatic conditions. Thus the average life of a female of *X. astia* in the first quarter of 1924 was 5·45 days and for the third 3·53, while the corresponding figures for the male were 2·57 and 2·20 days. Most figures for *X. cheopis* were distinctly larger than those for *X. astia,* indicating that the former flea is able to survive a little longer apart from its host under Colombo conditions. Attention is called to the small number of fleas caught by guineapig flea traps left in plague houses in Colombo and Kuala Lumpur, and the great success of the method in Bombay, Egypt and elsewhere. The biting habits of fleas were studied in detail and, on the whole, after making allowance for the difference in biting habits and the different interval between feeds upon their natural hosts, the author is inclined to the opinion that *X. cheopis* bites man somewhat more readily than *X. astia,* but that the difference does

not appear to be sufficient to account for the correlation between the relative distribution of *X. cheopis* and that of epidemic plague.

A key (by Dr. K. Jordan) to the principal genera of fleas found on rats and a list of species are given.

Hirst (S.). **The Principal Species of Acari Parasitic on Rats, with brief Notes on Hosts and Distribution.**—*Ceylon Jl. Sci.*, Sect. D, Med. Sci., i, pt. 4, pp. 273–276, 7 pls., 6 refs. Colombo, 18th December 1926. [Recd. March 1927.]

A key to the principal genera of blood-sucking mites found on rats and a list of seven of the species are given, together with notes on their distribution and hosts. The most important genus is *Liponyssus*, *L. bacoti*, Hirst, having been found on both the brown rat [*Mus norvegicus*] and black rat [*Mus rattus*]. This species has been known to attack man in the United States [*R.A.E.*, B, xii, 3], South Africa and Australia. The only other mites at all likely to convey plague from rats to man belong to the genus *Dermanyssus*. Three species of this genus occur on rodents that frequent human abodes. Numerous species of the genus *Laelaps* are also present on rodents, but will not apparently bite man.

Symposium on Tick Eradication.—*Jl. Amer. Vet. Med. Assoc.*, lxx, no. 6, pp. 746–763, 1 map. Detroit, Mich., March 1927.

J. H. Bux discussed the effect of inadequate Federal legislation dealing with the inter-state movement of tick-infested cattle on the campaign for eradication of cattle ticks in the southern United States. The necessity for adequate state legislation and for co-operation between the federal government, the state, the county, and individual cattle-owners was dealt with by H. Robbins. In a discourse on the attitude of Texas cattle-owners towards tick-eradication, E. B. Spiller showed that the majority were fully alive to the importance of this measure but pointed out the great expense that was incurred on large ranches where the owner had to build his own dipping tanks and in some cases employ men to dip cattle every day in order that each animal might be dipped at fortnightly intervals. P. F. Bahnsen stated that the section of the Federal law permitting the interstate movement of tick-infested cattle had recently been repealed [*R.A.E.*, B, xv, 76].

Blacklock (D. B.). **The Insect Transmission of *Onchocerca volvulus* (Leuckart, 1893).**—*Brit. Med. Jl.*, no. 3446, pp. 129–133, 2 figs., 10 refs. London, 22nd January 1927.

The information contained in the first part of this paper, on the development of *Onchocerca volvulus* in *Simulium damnosum*, Theo., has already been noticed [*R.A.E.*, B, xiv, 62, 167]. *O. caecutiens*, a parasite of man in certain parts of Central America, is so closely allied to *O. volvulus* that some authors consider it identical. *S. dinelli*, Joan, and *S. samboni*, Jennings, have been suggested as possible vectors [*R.A.E.*, B, vii, 159].

A species of *Onchocerca* [*cf. R.A.E.*, B, xi, 40] is a parasite of cattle of considerable importance in Australia, causing nodules that damage the meat and render it unsaleable. It has been estimated that the discovery of the vector, which may prove to be a Simuliid, might eventually save Queensland over £1,000,000 annually.

Roubaud (E.) & Colas-Belcour (J.). **Action des diastases dans le déterminisme d'éclosion de l'oeuf chez le moustique de la fièvre jaune.**—*C.R. Acad. Sci. France*, clxxxiv, no. 4, pp. 248–249, 2 refs. Paris 1927.

The yellow fever mosquito, *Aëdes argenteus*, Poir., lays its eggs in the water in cisterns, etc., or on the walls of the container. After 2–3 days the larvae are ready to hatch, but this does not take place spontaneously. In pure, or only slightly impure, water, the eggs may remain dormant for months, but they hatch quickly in dirty water, rich in organic matter and containing bacteria or yeasts. They also hatch in large numbers in living cultures of *Bacillus coli* and yeasts, and also in filtered extracts of such cultures, which, when sufficiently concentrated, are as active as the cultures themselves, contrary to Bacot's observations [*R.A.E.*, B, v, 74]. The authors, therefore, consider that the hatching of the eggs of this mosquito is governed in nature by the presence of the soluble ferments in dirty water. Other experiments have shown that the animal or vegetable diastases (pepsine, trypsine, papaïne) in sterile solutions act in the same way. The speed of hatching is proportional to the diastase concentration of the solutions. It may happen in a few minutes with strong concentrations capable of causing the rapid death of the young larvae after hatching, but may take days with weak concentrations. Hatching even takes place in conditions of alkalinity, acidity, or temperature far from the optimum of activity of the different diastases. The hatching depends entirely on the biological activity of the diastases.

Schüffner (W.) & Mochtar (A.). **Gelbfieber und Weilsche Krankheit.** [Yellow Fever and Weil's Disease.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 4, pp. 149–165, 14 figs., 10 refs. Leipzig, April 1927.

This paper gives a detailed account of research conducted at Amsterdam on the causal agent of yellow fever. Cultures were made with a yellow fever virus isolated in 1921 at Vera Cruz, and these were compared with *Leptospira* existing in the Tropical Institute, Amsterdam. Noguchi was able to find differences between *Leptospira icteroides*, considered to be the causal organism of yellow fever, and other *Leptospira*, but this the authors failed to do. There is a remote possibility that the yellow fever strains had become modified and had assumed the characters of *L. icterohaemorrhagiae*, the causal organism of infectious jaundice (Weil's disease), but if this is not so, the entire yellow fever question requires re-examination. There are four possibilities regarding the part played by *L. icteroides* in the aetiology. Either it is not the cause of yellow fever, cases of infectious jaundice having been diagnosed as yellow fever; or it is only a secondary occurrence in symbiosis with the true virus, which is considered most improbable [but *cf. R.A.E.*, B, xiii, 9]; or it is really the causal organism of yellow fever and in all respects identical with *L. icterohaemorrhagiae*, thus indicating that infectious jaundice is a form of yellow fever occurring in temperate climates; or, finally, *L. icteroides* and *L. icterohaemorrhagiae* are different organisms and yellow fever and infectious jaundice are distinct diseases.

The lines that further research on this question should follow are indicated. Extensive experiments should be made with *Aëdes*

argenteus (*aegypti*), including attempts to transmit *L. icterohaemorrhagiae* by its agency. The authors' own experiments with this mosquito, only 72 in number, have given no positive results.

Prado (A.) & Pessoa (S. B.). **Ligeiras consideraçoes sobre alguns pontos da epidemiologia e prophylaxia da malaria no Estado de S. Paulo.** [Notes on certain Aspects of the Epidemiology and Prophylaxis of Malaria in the State of S. Paulo.]—*Sciencia med.*, v, no. 2, pp. 81–99, 2 figs. Rio de Janeiro, 28th February 1927.

In the Brazilian state of S. Paulo mortality from malaria increases when the rainfall is abundant and decreases when it is scanty. There are about 100,000 acres of banana plantations, and the trenches dug for planting bananas are the chief breeding-places of Anophelines. The principal vector of benign tertian is *Anopheles tarsimaculatus*, and of malignant tertian, *A. argyritarsis*, though the latter appears to be able to transmit benign tertian also.

Williams (L. L.), jr., & Cook (S. S.). **Paris Green applied by Airplane in the Control of *Anopheles* Production.**—*Pub. Health Repts.*, xlii, no. 7, pp. 459–480, 6 figs., 10 refs. Washington, D.C., 18th February 1927.

From 1917 to 1925 oiling and draining for the control of mosquito breeding at Quantico, Virginia, where Anophelines were numerous in late summer and autumn, reduced the infestation but did not succeed in eliminating malaria. In 1926, therefore, it was decided in addition to these measures, to attempt the control of heavy infestations of *Anopheles quadrimaculatus*, Say, lasting from mid-July till October, in the neighbouring river-mouths and creeks, by the distribution of Paris green from aeroplanes. Details of the methods employed and the numerous experiments carried out are given, and the nature of the country, which consisted mainly of tidal marshes, is described. Dusting with 1 lb. Paris green to the acre proved effective against Anopheline larvae in all types of vegetation, but did not affect Culicine larvae. Paris green does not affect the pupae, and the authors consider that ½ lb. to the acre does not leave a sufficient margin of safety [*cf. R.A.E.*, B, xiv, 126]. Hydrated lime and powdered soapstone proved equally satisfactory as carriers. With wind velocities of less than 4 miles an hour and flying heights of not more than 100 ft., 1 lb. of Paris green with 3 lb. of carrier was found to be effective, while with a greater wind velocity and above 100 ft., it was necessary to use only 1 lb. of carrier to 1 lb. of Paris green. Where the infestation was continuous and severe, it was found necessary to dust at weekly intervals. The cost of the material used was about 3*s.* an acre.

For the purpose of testing larval mortality, pans half-filled with water, containing larvae of *Anopheles* and *Culex* were placed at intervals of 25 ft. on paths cut half a mile apart across the dusting area. Glass slides 2 in. by 4 in. placed beside each pan effectively revealed the distribution and concentration of Paris green, but the pans of larvae, though useful, did not give conclusive evidence of the mortality rate, the best method of determining the latter being dipping for larvae in the natural breeding areas.

Twinn (C. R.). **Mosquitoes from Baffin Land.**—*Canad. Ent.*, lix, no. 2, pp. 47–49, 2 figs., 4 refs. Orillia, Ont., February 1927.

Larvae of *Aëdes* were common in Baffin Land in shallow pools in the latter part of June. The adults appeared at the end of June, becoming most numerous in late July and early August. A brief description is given of the larva, which very closely resembles that of *A. alpinus*, L. The adults are identical with *A. nearcticus*, Dyar, and the identity or otherwise of this species with *A. alpinus* is discussed.

Kirkpatrick (T. W.). *Culex* (*Lasiosiphon*) *adairi*, **nom. nov.**—*Bull. Soc. R. ent. Egypte*, xix (1926), p. 112. Cairo, 1927.

Culex adairi, n. n., is suggested for *C. pluvialis*, Kirkpatrick nec Barraud [*R.A.E.*, B, xii, 112; xiii, 125].

Cooling (L. E.). **Australian Fish as Mosquito Larvae Destroyers.**—*Health*, vi, no. 1, pp. 11–12. Melbourne, January 1927.

The scarcity of records of fish destroying mosquito larvae in Australia is pointed out. Reference is made to an attempt on the part of the Germans to introduce Australian larvicidal fish into New Guinea, which, after two failures, proved successful in 1914, when four species of fish were imported from Sydney into the Bismarck Archipelago.

The ideal characteristics of a larvicidal fish are small size, preferably not more than 50 mm. in length; capability of adjusting itself to various environments such as stagnant and running water and artificial containers; and ability to move freely in aquatic vegetation and to live in the shallow waters inhabited by mosquito larvae. It should be a top feeder and one that naturally attacks mosquito larvae. A carnivorous fish is generally preferable to an omnivorous one. In addition to the fish previously noticed in Australia [*R.A.E.*, B, xi, 124], the family Centropomidae (including the genus *Ambasis*) is stated to contain good larvae destroyers.

[Latuishev (N. I.).] **Латышев (Н.). On the Malaria Mosquitos of Central Asia.** [*In Russian.*]—8vo, 21 pp., 7 figs., 5 pls. Tashkent, Polit. Voenno-sanit. Uprav., 1926. [Recd. February 1927.]

This work is intended for the use of army medical officers in Turkestan to facilitate the identification of the local Anophelines. Keys and illustrations are given to the species occurring in Central Asia, viz., *Anopheles maculipennis*, Mg. (*claviger*, auct.), *A. sacharovi*, Favr (*elutus*, Edw.), *A. bifurcatus*, L., *A. hyrcanus* var. *pseudopictus*, Grassi, *A. superpictus*, Grassi, and *A. pulcherrimus*, Theo. The rôle of the last named as a malaria carrier has not been definitely determined. There was no marked development of the disease in the areas of its maximum distribution in 1925. The most important species are *A. maculipennis* and *A. superpictus*. *A. sacharovi* may prove of equal importance; all the mosquitos received from Fergana in 1925 as *A. maculipennis* proved to be *A. sacharovi*.

A short account is given of various local forms of relapsing fever that might be mistaken for malaria. Some of the cases are clinically and microscopically identical with Persian relapsing fever and have been proved by the author in experiments on himself to be transmitted by *Ornithodorus lahorensis*, Neum. (*tholozani*, Lab. & Mégn.).

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). Instructions for Collecting Zoological Material. XIV. Instructions for Collecting, Studying and Preserving Mosquitos.** [*In Russian.*]—8vo, 76 pp., 3 pls., 27 figs. Leningrad, Zool. Mus. Acad. Sci. U.S.S.R. Price 1*r.*

This is a second and amplified edition of a paper previously noticed [*R.A.E.*, B, xiv, 67] and includes Shtakel'berg's key to the genera of the mosquitos of European and Asiatic Russia [*R.A.E.*, B, xiv, 151].

Covell (G.). **The Distribution of Anopheline Mosquitoes in India and Ceylon.**—*Indian Med. Res. Memoirs*, no. 5, 85 pp., 37 maps, 11 pp. refs. Calcutta, February 1927.

Since the publication of two papers by Christophers on the mosquitos of India [*R.A.E.*, B, iv, 74; x, 78], a large number of additional records has been received, and a certain number of new species and varieties have been reported from various parts of the Indian Empire. The 40 species and varieties found in India and Ceylon are here divided into three groups, viz., Mediterranean species penetrating into north-west India, Palaearctic species occurring in Northern India, and Oriental species, this last group including five sub-divisions. Each species and variety is dealt with separately and notes are given on its distribution, habits and breeding-places, and its importance as a carrier of malaria. The synonymy follows that of Christophers [*R.A.E.*, B, xiii, 109].

It is probable that humidity is the most important factor affecting distribution. Thus the occurrence of *Anopheles aitkeni*, James, *A. vagus*, Dön., *A. karwari*, James, *A. leucosphyrus*, Dön., *A. jamesi*, Theo., and *A. minimus*, Theo., corresponds very closely to those areas where the mean annual rainfall exceeds 50 inches. Such species as *A. barbirostris*, Wulp, *A. maculipalpis* var. *indiensis*, Theo., *A. maculatus*, Theo., and *A. tessellatus*, Theo., occur generally throughout India, except in those areas where the annual rainfall is less than 20 inches; and *A. pulcherrimus*, Theo., is apparently specially adapted for life in alluvial desert country where the mean annual rainfall is less than 20 inches. The effect of altitude is shown in the distribution of *A. lindesayi*, Giles, and *A. gigas*, Giles, which are found at altitudes above 3,000 ft., where their occurrence is, no doubt, largely affected by temperature. The influence of man as a factor affecting distribution is also briefly discussed.

Shortt (H. E.) & Swaminath (C. S.). **The Mode of Formation and Morphology of the O Bodies of Row in old Cultures of** *Leishmania donovani*.—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 581–587, 1 pl., 8 refs. Calcutta, January 1927.

All aflagellate forms found in old cultures of flagellates and classed together as O bodies are not necessarily identical in structure. Reasons are given for considering that in the case of *Leishmania donovani* the O bodies are end products of degeneration and are not viable. If it is admitted that some of the O bodies in cultures of natural Herpetomonad parasites of insects may occasionally be viable, and that the similar cystic forms found in their insect hosts are the usual means by which the infection is transmitted from insect to insect, it does not follow that the same applies to those present in cultures of *L. donovani*. In the light of present knowledge on the life-history of this flagellate, it seems almost certain that it gains access to the vertebrate host through an insect intermediary, and that the production of a special resistant form is unnecessary.

BARRAUD (P. J.). **A Revision of the Culicine Mosquitoes of India. Part XIX. The Indian Species of** *Aëdomyia* **and** *Orthopodomyia* **with Descriptions of two New Species. Part XX. The Indian Species of** *Armigeres* **(including** *Leicesteria*) **with Descriptions of two New Species. Part XXI. Descriptions of New Species of** *Aëdimorphus* **and** *Finlaya*, **and Notes on** *Stegomyia albolineata* **(Theo.). Part XXII. The Indian Species of the Genus** *Taeniorhynchus* **(including** *Mansonioides*), **with a Description of one New Species.**—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 523–563, 5 pls., 4 figs. 3 refs. Calcutta, January 1927.

These papers include keys to the Oriental species of the genera, *Orthopodomyia* and *Armigeres*. The new species described are: *O. flavithorax* and *O. flavicosta*, both bred from larvae found in water in tree-holes in North Kanara; *A.* (*Leicesteria*) *inchoatus*, bred from larvae found in water in a bamboo stump in the Eastern Himalayas; *A.* (*L.*) *dentatus*, from Assam; *Aëdes* (*Aëdimorphus*) *nigrostriatus*, from Assam, where freshly fed females were caught in cow-sheds, and Rangoon; *A.* (*A.*) *littoralis*, from Bombay Harbour; *A.* (*Finlaya*) *subsimilis*, bred from a larva taken from a bamboo stump in North Bengal; and *Taeniorhynchus* (*Coquillettidia*) *novochraceus*, from Assam.

Notes are given on the synonymy of the species dealt with, including *Armigeres* (*Leicesteria*) *flavus*, Leic. (*apicalis*, Theo.).

Armigeres obturbans, Wlk., is common over the greater part of India, but in the Eastern Himalayas, the Assam Hills, and the upper Assam valley it is largely replaced by *A. kuchingensis*, Edw. The author considers *A. durhami*, Edw., to be merely a form of the latter, of which he also describes three new forms.

SHORTT (H. E.), CRAIGHEAD (A. C.), KHAZAN CHAND & SWAMINATH (C. S.). **The "Resistant Non-flagellate Torpedo and O Bodies" of Row seen in old Cultures of** *Leishmania donovani* **in their Relationship to the Production of Infections.**—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 567–576, 5 refs. Calcutta, January 1927.

In view of certain theories propounded by Row [*R.A.E.*, B, x, 230], the authors have conducted a series of experiments the details and technique of which are described. The results led to the following conclusions: The flagellate forms of *Leishmania donovani* found in cultures are capable of producing infection when inoculated intraperitoneally into white mice without the presence of the O bodies. One inoculation of a culture of *L. donovani* is usually sufficient to produce an infection in white mice. O bodies are produced in cultures of *L. donovani* irrespective of the desiccation of the medium, and are most abundantly produced in the richest cultures. It has been shown that O bodies may be produced in the gut of *Phlebotomus argentipes* after a second or subsequent feed, but the forms encountered in or near the mouth-parts are flagellated. All the evidence available at present is against the probability of the O body playing any part whatever in producing infections.

SHORTT (H. E.), BARRAUD (P. J.) & CRAIGHEAD (A. C.). **Note on the Infectivity of the Forms of** *Leishmania donovani* **found in** *Phlebotomus argentipes*.—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 577–579, 1 ref. Calcutta, January 1927.

A series of experiments have been made in order to ascertain whether the forms of *Leishmania donovani* found in the gut of

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Phlebotomus argentipes, Ann. & Brun., are infective to susceptible animals inoculated with them. Numerous white mice were given intra-peritoneal injections of the teased infected gut in 0·85 per cent. saline solution. Most of the mice received one or two injections, but a few received three. Only one became infected; this animal had received three injections, the first 11 days after the infective feed of the sandfly and the second and third each 9 days after the infective feed. All three flies were given three feeds, the first on an infective kala-azar case, the second on a rabbit and the third on a hamster. The mouse was examined 5 months after the first inoculation and found to be healthy, the liver and spleen, however, yielded good cultures on NNN medium. It is, therefore, proved that the form of *L. donovani* present in the gut of *P. argentipes* is infective, and that, in view of the minuteness of the dose represented by the gut contents of even three sandflies, the mouse is a suitable animal for experimental work with *L. donovani*.

McCombie Young (T. C.). **Some Observations on Sandflies in Bombay City.**—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 679–683. Calcutta, January 1927.

A survey of Bombay City has shown that the species of *Phlebotomus* present are *P. argentipes*, Ann. & Brun., *P. papatasii*, Scop., *P. minutus*, Rond., and *P. minutus* var. *niger*, Ann.

The local prevalence of *P. papatasii* is apparently due to this sandfly breeding in earthworks, pits, etc., in connection with building operations in the immediate vicinity. P. *argentipes* was collected in widely separated areas throughout the City, chiefly in cowsheds, both before and after the onset of the monsoon. During April and May, and to a less extent in June, small numbers were caught daily in a bedroom and bathroom of the lower storey of a house; with the advent of the monsoon none was obtainable there, whereas servants sleeping only 20 yards away in the open were persistently attacked.

Notwithstanding the presence of *P. argentipes*, the presumptive insect vector of kala-azar, and the fact that the meteorological conditions appear to be particularly favourable to its transmission, it appears that kala-azar is rarely, if ever, seen as an indigenous disease in Bombay.

Napier (L. E.) & Smith (R. O. A.). **The Development of *Leishmania donovani* in the Gut of the Sandfly *Phlebotomus papatasii*.**—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 713–716, 5 refs. Calcutta, January 1927.

Of the three species of *Phlebotomus* that occur in Calcutta, *P. squamipleuris*, Newst., was only found in small numbers; *P. minutus*, Rond., does not readily feed on man, and no human blood was found in the specimens caught, so that *P. argentipes*, Ann. & Brun., is the only species under suspicion in connection with kala-azar. During 1925 investigations were extended to the villages outside Calcutta. Large numbers of *P. argentipes* and of *P. papatasii*, Scop., occurred in huts and in the adjoining cow-sheds.

In experiments laboratory-bred individuals of both these species were fed on the arms of kala-azar patients. The individuals of *P. argentipes* were examined 72 hours after the feed, but as the blood is digested more slowly in *P. papatasii* the latter were examined 96 hours

after the feed. Flagellate infection was found in 43 out of 102 *P. argentipes* and in 2 out of 101 *P. papatasii*. In the latter typical Herpetomonad forms of *Leishmania* were observed in the midgut of the flies, but in neither instance was the infection a particularly heavy one. It is interesting to note, though probably only coincidence, that although six patients were used in these experiments, each of the two blood-meals that caused an infection in *P. papatasii* were provided by the same patient.

The distribution of *P. papatasii* in India does not coincide with that of kala-azar ; it is most abundant in the hot dry plains of the Punjab and the North-West Frontier where the disease is not endemic. It is, therefore, very unlikely that this sandfly has any important relation to kala-azar, though under exceptionally favourable conditions it may possibly transmit it.

CHALAM (B. S.). **Note on some Points regarding Fertilisation and Development of the Ovum in *Anopheles* in Captivity.**—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 775–777. Calcutta, January 1927.

Laboratory bred females of *Anopheles stephensi*, List., that were kept with Culicine males were found to contain well developed eggs, after they had fed on human blood. Experiments were therefore undertaken with a view to ascertaining the possibility of cross-fertilisation. For this purpose *A. stephensi*, *A. subpictus*, Grassi, and species of *Culex* and *Aëdes* were used. The following are among the author's conclusions: Cross-fertilisation did not take place. Though the ovum developed and some mosquitos even laid eggs after feeding on blood without fertilisation, such eggs did not hatch. The eggs did not develop with or without fertilisation when the mosquito was not fed on blood.

ZEITOUN (M.). **Maladie du sommeil ou trypanosomiase africaine.**—*Rev. prat. Maladies Pays chauds*, vi, no. 10, pp. 517–531, 6 figs. Paris, December 1926. [Received March 1927.]

This is a review of the history and characteristics of the type of sleeping-sickness caused by *Trypanosoma gambiense*, in Africa, with a brief description of *Glossina palpalis*, R.-D., and its bionomics and the part it plays in the transmission of the disease.

CHADWICK (C. R.) & MCHATTIE (C.). **Notes on Cutaneous Leishmaniasis of Dogs in Iraq.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 7, pp. 422–432, 3 pls., 26 refs. London, March 1927.

Material from ulcers occurring on dogs in Iraq showed parasites having apparently the same structure as *Leishmania tropica* in preparations from oriental sore. It has been observed in India that kala-azar is largely confined to areas of alluvial soil, but canine leishmaniasis in Iraq occurs both in the alluvial area and outside it, in places where vegetation is good and where it is scanty, at sea-level and at altitudes up to 750 ft., and equally under good and bad sanitary conditions. The incubation period is at least a month, possibly two or three, the recognisable lesions occurring between November and early April. Healing takes place in May, after which no cases are found till October. The non-occurrence of the disease during the

summer months is possibly due to the rise in temperature. The effect of temperature and humidity on the incidence of insect-borne disease in Baghdad is shown by its freedom from malaria, which is due to the fact that the wet and cold seasons coincide, while as soon as the temperature becomes favourable to the mosquito the atmosphere is dry. Thus a combination of temperature over 61°F. and a relative humidity of over 63 per cent. rarely occurs. Even an accidental rise in humidity consequent on floods during a period of high temperature in 1926, which enabled mosquitos to withstand the temperature and resulted in an increase of malaria, gave rise to no additional cases of leishmaniasis in dogs. In view of the fact that the enormous increase in sandflies during May and June does not lead, on the expiration of the incubation period in July and August, to an increased number of cases of canine leishmaniasis, it would appear either that the incubation period is longer than is generally supposed or that *Phlebotomus* is not the carrier. No trace of visceral leishmaniasis was found in dogs in the course of extensive investigations, and no morphological difference has been detected between the parasites and those taken from cases of oriental sore in man, which is equally prevalent in Baghdad.

Mason (G. B.). **A Method for destroying Fly Larvae developing in Stable Manure.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 7, pp. 433–435, 2 figs. London, March 1927.

This is a shorter account of a method already noticed [*R.A.E.*, B, xiv, 187]. The possibility of the larvae escaping from outdoor traps in rainy weather is pointed out. This difficulty can be overcome by making the frontal gutter continuous all round, so that any larvae that succeeded in climbing the walls when they were wet would be caught outside.

Pavlovsky (E. N.) & Stein (A. K.). **The Cutaneous Poison of the Beetle,** *Paederus fuscipes*.—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 7, pp. 450–451. London, March 1927.

This is a translation of a paper already noticed [*R.A.E.*, B, xv, 44].

Ashner (M.). **Observations on the breeding of** *Phlebotomus papatasii*. —*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 7, pp. 452–454, 3 refs. London, March 1927.

Attempts to rear *Phlebotomus papatasii*, Scop., in Jerusalem in 1926 in petri dishes containing several layers of damp filter paper, as employed by Christophers [*R.A.E.*, B, xiv, 139], proved unsuccessful owing to excessive formation of mould, while similar experiments with porous earthenware pots standing in a dish partly filled with water as described by Young and his co-workers [*R.A.E.*, B, xiv, 147] gave variable, if better, results.

Subsequent detailed study of the factors influencing the development of *P. papatasii* showed that one part sifted garden soil to two parts of crushed rabbit faeces with the addition of water to form a thick paste constituted a satisfactory food, immune from mould. The quantity given to the larvae varied according to their number and size up to a layer of 1–2 cm. in the bottom of the vessel. The most favourable temperature was found to be 30–32°C. [86–89·6°F.], at which the

egg stage lasted 6 days, the larval stage 20 days, and the pupal period 6 days, as compared with 12–15, 30–35 and 13–15 days respectively at 23–25°C. [73·4–77°F.]. In addition to the reduction by about half of the period of development, which was strikingly uniform with succeeding batches of flies, the growth of injurious moulds is prevented by the increased activity and quicker feeding of the larvae. If the larvae are forced to pupate in an over-moist environment, a large number of the pupae die. According to the author's observations the proper degree of moisture is already surpassed if small drops or even a thin film be visible on the surface of the particles [*cf. R.A.E.*, B, xii, 24]. If the larvae pupate in the food substance without migrating, normal conditions of moisture may be assumed.

Several generations of *P. papatasii* can be raised without any difficulty under laboratory conditions by the following procedure, which yielded uniform results: Twenty to thirty females were placed in an earthenware pot 15 cm. in diameter by 5 cm. deep, covered with a piece of cloth and kept in an incubator at a temperature of 30–32°C. The pot was placed in a dish containing either water, in which case the concentration of moisture was regulated by increasing or decreasing the depth, or damp soil, of which the degree of moisture could be varied. The females laid their eggs and died within 5–6 days, the first larvae hatching 3–4 days later. The larvae do not live more than a day without food. The adults continue to emerge from the pupae for two or three weeks under normal conditions, but may take over a month. Males and females emerge simultaneously and in equal numbers, so that females become fertilised while still in the breeding pot. Laboratory-bred females feed two or three times during the first week, and at a temperature of 25°C. oviposition begins 9 days after the first blood meal.

MYERS (G. S.). **An Analysis of the Genera of Neotropical Killifishes allied to** *Rivulus*.—*Ann. & Mag. Nat. Hist.*, (9) xix, no. 109, pp. 115–129. London, January 1927.

This is a systematic account of the fish of the Neotropical region belonging to the tribe RIVULINI of the Poeciliid subfamily FUNDULINAE, including descriptions of new genera and species. These fish destroy mosquito larvae.

HOFFMANN (W. A.). **Biological Notes on Haitian Anophelines.**—*Jl. Wash. Acad. Sci.*, xvii, no. 7, p. 175. Baltimore, Md., 4th April 1927.

Only the author's abstract of this paper is published.

In a discussion on the two species of *Anopheles* known from Haiti, *A. grabhami* and *A. albimanus*, emphasis was placed on the relations between the larvae and their environment. *A. albimanus* generally breeds in still water exposed to the sun, *A. grabhami* in shaded streams. In some localities very few larvae of *A. albimanus* were found in the springs, while in others they abounded. This was believed to be due to the different plant constituents present in the springs. *A. grabhami* seldom occurs in rice-fields. It is most abundant from January to March, whereas *A. albimanus* is prevalent during the last third or last quarter of the year. The latter is believed to be the species chiefly responsible for the transmission of malaria, and where favourable

conditions obtain at all times, great numbers can be taken throughout the year. The food of the larvae is blue-green algae, *Spirogyra*, diatoms and plankton. The best control is cleaning out vegetation.

EWING (H. E.). **Recent Developments in regard to the Control of Chiggers.**—*Jl. Wash. Acad. Sci.*, xvii, no. 7, p. 182. Baltimore, Md., 4th April 1927.

At a summer camp on Chesapeake Bay the control methods found effective against chigger mites [*Trombicula irritans*, Riley] were the use of sulphur in all seriously infested spots, including paths, cleaning up all dead leaves and other litter near the tents, and protection against the mites by applying sulphur to the skin and clothing. The common box turtle proved to be the most important natural host [*R.A.E.*, A, xiv, 89]. These turtles are being removed, and the camp ground is being stocked with the other species of turtle, none of which harbours this mite.

SWELLENGREBEL (N. H.). **La signification du nombre relatif des mâles dans les abris des *Anopheles* adultes.**—*Bull. Soc. Path. exot.*, xx, no. 2, pp. 121–123. Paris, February 1927.

Previous workers have already questioned the supposition that the proportion of males found in Anopheline resting-places indicates the distance from the breeding-place [*R.A.E.*, B, xiii, 55], and in a previous paper [*R.A.E.*, B, xiii, 6] the author remarked that the relative number of males of *Anopheles maculipennis*, Mg., is sometimes greater in houses than in stables. From observations during May to October, 1921–1926, in Holland the author recorded a much smaller proportion of males than previous workers and attributes this to the fact that the observations covered the entire period of emergence, from the appearance of the first male to the end, and not only the period of greatest larval activity. It was always found that blood was easily accessible in places where the number of males was highest, and that where nourishment was less abundant the number was lower. It does not follow that it is the varying number of females of *A. maculipennis* attracted by scarcity or abundance of food, that causes the variations in the proportion of males, as is the case with *A. quadrimaculatus*, Say. The author believes that the males congregate for preference in suitable resting-places and that what they chiefly seek is shelter, and not food in addition, as do the females. When a suitable shelter is found, mosquitos will stay there for long periods without moving ; it is therefore a matter of great importance whether a human habitation forms a good shelter for them or not.

Roubaud, commenting on this paper, expressed his agreement with this theory, and pointed out that it is possible to find places in which blood is available and which also supply suitable shelter.

DE ROOK (H.) & SWELLENGREBEL (N. H.). **Effets comparés du " vert de Paris " et de la paraffine liquide, comme larvicides.**—*Bull. Soc. Path. exot.*, xx, no. 2, pp. 123–127. Paris, February 1927.

The authors compare the relative values of paraffin and Paris green as mosquito larvicides with particular reference to their use on a piece of land in the north of Holland, jutting out into the Zuider Zee

[*R.A.E.*, B, xv, 74]. It was found that Paris green did not kill aquatic animals or vegetation, while paraffin reduced all living matter in the water to a putrefying mass where nothing developed except Culicine larvae. Eggs deposited by Anophelines might hatch in this environment, but very few of the larvae reached maturity. Although Paris green eliminates the larvae from 1 to 3 days more quickly than paraffin, re-infestation occurs much more rapidly. Moreover, paraffin does not require any previous clearing of vegetation or an uninterrupted film over the water ; it kills the pupae, and its effect is not lessened by wind or rain. It is five times more expensive than Paris green but is applied in one-fourth or one-fifth of the time (and in Holland labour is the chief expense), and for these reasons it is preferred in the district under discussion, except in the large canals.

Roubaud, commenting on this paper, remarked that the dose of Paris green required (approximately 2 lb. an acre) entails considerable expense, while approximately 2 lb. of the larvicide previously described by him [*R.A.E.*, B, xiv, 121] is sufficient to treat at least 12 acres.

[Rukhadze (N. P.).] Roukhadzé (N.). **La stabulation du bétail, comme facteur de réduction du paludisme, dans certaines contrées d'Abkhasie (Géorgie).**—*Bull. Soc. Path. exot.*, xx, no. 2, pp. 153–170, 14 refs. Paris, February 1927.

The malaria survey previously reported in certain parts of Georgia [*R.A.E.*, B, xiv, 79] has been continued and extended. It was found that the greatest number of malaria cases occurred in the village where the fewest mosquitos were present. This fact, and all the observations made, confirmed the theory that the intensity of malaria is inversely proportionate to the number of cattle kept in stables. The protection afforded by cattle properly stabled was illustrated in one village where malaria was absent in spite of the villagers being so poor and badly nourished that tuberculosis was common ; this refutes the generally accepted theory that a good standard of life is a protection in a malarial country. The most numerous mosquito captured during the survey was *Anopheles maculipennis*, Mg. ; 5 to 10 per cent. were *A. bifurcatus*, L., and 1 to 2 per cent. *A. plumbeus*, Hal. (*nigripes*, Staeg.). In two of the districts examined the total number of cattle kept was the same, but in the one case, where the animals were well stabled, the malaria incidence was much less than in the other. The mere numbers of cattle kept are therefore of no significance with regard to malaria, the manner of stabling them being the important point. General conditions in the Caucasus do not favour good stabling and are not likely to be improved. Nevertheless, it is essential that the present methods should be artificially ameliorated, especially in the large pig-rearing areas of Georgia. The buildings in which pigs are kept are so hot in summer that they are allowed to remain out all night, but if better ventilated, though properly closed, buildings could be substituted, malarial conditions would undoubtedly improve.

Schwetz (J.). **Contribution à l'étude des moustiques d'Elisabethville et de quelques autres localités du Katanga (Congo belge).**—*Bull. Soc. Path. exot.*, xx, no. 2, pp. 170–192, 1 map, 3 refs. Paris, February 1927.

The mosquitos of the Belgian Congo have been very little studied. The author gives a preliminary account based on a somewhat superficial

examination of the mosquitos collected in Elisabethville and other parts of Katanga. The topography of the district is described and sketched in a map, and general notes are given on the seasonal occurrence and habitats of some mosquitos in Elisabethville, with detailed supplementary notes on many of the species dealt with. The favourite local breeding-places are discussed. Of the Anophelines, *Anopheles gambiae*, Giles (*costalis*, Theo.) is of the commonest occurrence, both among the larvae collected and the adults in houses. *A. funestus*, Giles, is almost as common in houses, and these two species constitute 99 per cent. of the Anopheline fauna of Elisabethville and are the cause of malaria there. Less important species are *A.* (*Christya*) *implexus*, Theo.; *A. maculipalpis*, Giles; *A. mauritianus*, Grp.; *A. squamosus*, Theo.; *A. pitchfordi*, Giles; *A. transvaalensis*, Carter; *A. wellcomei*, Theo.; *A. pharoensis*, Theo.; and *A. theileri*, Edw. Anophelines captured in other regions of Katanga include *A. kingi*, Christ., and *A. distinctus*, N. & C.

Culex pipiens, L., which has never been previously recorded from the Congo and was thought not to occur there, was found on several occasions in the larval stage in the town of Elisabethville, but has never been taken in houses.

Chamberlain (W. P.) & Curry (D. P.). **Present Status of the Malaria Problem and Mosquito Control.**—*Rept. Health Dept. Panama Canal 1925*, pp. 13–21, 2 maps. Mount Hope, C.Z., 1926. [Recd. March 1927.]

Although there are about 135 species of mosquitos on the Isthmus of Panama only a few of them are of importance, the chief being *Anopheles albimanus*, Wied., and *A. tarsimaculatus*, Goeldi, which are the principal carriers of malaria, *Aëdes argenteus*, Poir. (*aegypti*, L.), the carrier of yellow fever and probably of dengue, and *A. taeniorhynchus*, Wied., which is a troublesome biter. Recent surveys in the cities of Panama and Colon showed that *A. argenteus* was breeding in less than 1 per cent. of the houses, and it is considered that in view of its rarity, of the maritime quarantine maintained by the Health Department, and of the fact that yellow fever has almost disappeared from America, the occurrence of an epidemic in the Isthmus has become virtually impossible. *A. taeniorhynchus* breeds to a limited extent in brackish swamps and tidal rock pools, but principally in the water that collects with the first rains in deep cracks formed during the dry season on hydraulic fills; in 1925 and 1926, however, this was almost entirely prevented by pumping dredged mud on to the filled areas just before the rains.

No attempt has ever been made to eliminate malaria completely in the Canal Zone, and this would be an exceedingly difficult and expensive undertaking, on account of the large areas over which Anophelines breed, the high rate of infection with latent malaria among the native population outside the areas where mosquito control has been carried out, the fact that those who contract malaria may remain infective indefinitely, and the frequency with which the inhabitants of the towns visit the rural areas for recreation. The fact that the malaria rate is not decreasing correspondingly to the progress of mosquito control work is probably partly due to a large proportion of the cases being contracted in the rural areas. The mosquito control work carried out from October 1924 to June 1926 is described. Around Panama

the drained area was extended to a distance of at least a mile from the edge of the city in all directions. In the Canal Zone the work consisted largely of replacing existing open earth drains by sub-soil tile drains or open concrete-bottomed ditches, and similar work was also carried out in the city of Panama. Tile drains are usually much cheaper than concrete-bottomed ones, and were used in about four-fifths of this permanent work, the average cost of which was about 2 shillings a linear foot. Whenever possible the tiles are laid at least 2 feet below the surface, and the trench is filled in with broken rock. This has the advantages of reducing the likelihood of the drains becoming blocked by grass roots and of lowering the ground water-level.

WILLIAMSON (K. B.). **Annual Report of the Malaria Bureau, Institute for Medical Research, Federated Malay States, for the Year 1925.**— *F.M.S. : Ann. Med. Rept., 1925,* reprint 10 pp. Kuala Lumpur, 1926 ; also in *Malayan Med. Jl.*, i, no. 4, pp. 21–27. Singapore, December 1926. [Recd. March 1927.]

Investigations of the factors affecting mosquito breeding were continued on the same lines as in the previous year [*R.A.E.*, B, xiv, 39]. In the rice-growing districts the distribution of Anopheline larvae proved to be very uneven, but the density of larvae appears to be considerably less than in the rice-fields of America. Observations indicate that there is an almost complete cessation of breeding in standing rice when the water has a pH of 6 or lower with a sharp decrease below pH 6·4. A fall of 0·5 in the pH value was observed between the middle of October and the middle of December, and a further fall to pH 6 is usual in the less acid fields when the water is drained off before harvest. The conditions suitable for Anopheline breeding are, in general, the same as those producing a good crop of rice ; acid and peaty soils restrict both the species and their abundance, only *Anopheles barbirostris*, Wulp, and *A. hyrcanus* var. *sinensis*, Wied., being present. However in those parts of Krian where the water is not markedly acid during the cropping period and heavy yields of rice are obtained the species are still restricted to the two above mentioned.

Of 955 dissected Anophelines only one specimen of *A. barbirostris* harboured parasites, these being benign tertian cysts. Immunity and the absence of gametes from the blood of all but a few young children among the resident population probably accounts for the small proportion of mosquitos infected.

A reservoir that supplies the Krian irrigation system has so far proved free from Anopheline breeding and experiments were carried out to determine whether Anopheline larvae placed in its water can survive and whether the absence of *A. aconitus*, Dön., which is suspected of being an important carrier of malaria in inland valleys, is attributable to the properties of the water supply rather than to the character of the Krian soil. The fact that 50 per cent. of nearly full-fed larvae emerged as adults (when not overcrowded) indicates that the water is not rapidly poisonous. No eggs of *A. aconitus* were available to prove whether unfed larvae could survive to maturity in the water, but the fact that some larvae hatching from eggs of *A. barbirostris* survived as long as 24 days shows that the water is not rapidly poisonous to larvae of this species. In these experiments overcrowding and the consequent insufficiency of food were more important causes of death among the nearly full-grown larvae than

any direct influence exerted by the water of the reservoir. This conclusion is supported by the fact that when larvae of *A. aconitus*, *A. barbirostris* and *A. fuliginosus*, Giles, were placed in cages in a lake, where they normally breed, and larvae of the first two species in cages in the reservoir practically the same percentage of adults emerged in both localities. When larvae of *A. hyrcanus* var. *sinensis* and *A. fuliginosus* were placed with food (algae, etc.) in the reservoir the percentage of emergence was approximately the same as that of *A. aconitus* under the same conditions. The water in the reservoir is peaty with a pH a little below 6 and that in the lake is non-peaty with a pH ranging up to 7. In February, when the water had been cut off from the fields, in single experiments in acid and very stagnant water (pH below 5) larvae of *A. hyrcanus* var. *sinensis*, *A. barbirostris*, *A. aconitus*, *A. separatus*, Leic., and *A. aitkeni*, James, all died in about 2 days, though a decreasing percentage of larvae of *A. umbrosus*, Theo., and *A. novumbrosus*, Strickl. (taken from peaty water of equal or greater acidity) survived in it as long as a week. No Anophelines are found in this water, and apparently none can live in it. None of the Krian waters tested at this time proved capable of keeping larvae alive, which is in accord with the fact that mosquito larvae become scarce when the water is cut off and increase in scarcity as the rice harvest progresses and the water becomes staler.

The most efficient of the active predatory water insects were large Belostomid bugs, while small species of the genus *Corixa* and allied bugs, though less individually efficient, compensate by their numbers. Since Belostomid bugs were easily reared in the laboratory and the other bugs are already an article of commerce in Chinese shops, the breeding of these insects on a large scale and their introduction into fish-ponds where Anophelines are abundant, might be a practicable measure. In the rice-fields small larvicidal fish, such as *Panelax* sp., are abundant.

In some localities, a yellow-flowered bladderwort (*Utricularia flexuosa*) replaces the *Chara* found in some of the non-peaty fields elsewhere, and its presence appears to characterise either the limitation of species to *A. barbirostris* and *A. hyrcanus* var. *sinensis*, or the entire or nearly entire absence of all breeding of Anophelines, as in the acid lands and the reservoir. In a lake where there is an abundance of *Chara*, *A. barbirostris*, *A. hyrcanus* var. *sinensis*, and *A. fuliginosus* breed.

Experiments with arsenious oxide from the local mines showed that it was an efficient larvicide, and since a surplus is produced its larvicidal power is of interest, though its rate of solution would have to be regulated in some way. A ferruginous residue kills larvae in a few hours when added fresh in sufficient quantity, and would probably prove a fairly efficient larvicide if used liberally in pools and ditches. Rubber oil proved an effective larvicide, and its addition to solar and crude oils increases their efficiency.

The dissection of larvae of different species from various localities in order to ascertain the nature of their food showed that algae, especially the more conspicuous forms, although associated with Anopheline larvae, usually form only a small portion of their food, the bulk of which is of an amorphous character and of obscure origin. They appear to contribute indirectly to the food supply by the infusoria, etc., that they harbour and by the products and associates of their decay, their main function being to purify and oxygenate the water. Nearly

full-grown larvae of *A. barbirostris* were found feeding to a very slight extent on a filamentous blue-green alga, resembling *Oscillatoria*, in a drainage channel where the pH varied from about 5·3 to 5·6 and where small numbers of *A. hyrcanus* var. *sinensis*, *A. fuliginosus* and *A. vagus*, Dön., were also found. This fact is important in that it shows that abundant breeding of some of the same species that are found in the rice crop may occur in water of a much greater degree of acidity than is favourable to them in the rice-fields, provided that there is a plentiful supply of food, and that other conditions, as yet not fully known are also favourable. In small accumulations of water, the destruction by a slowly dissolving chemical of the food of Anopheline larvae may give more permanent success at a smaller cost for labour than frequently repeated oiling. Among artificial foods, yeast sprinkled lightly on the water is sometimes efficient, and *A. maculatus*, Theo., has been reared from half-grown larvae placed with it in distilled water.

Only one other species of Anopheline in addition to those already mentioned in this and the previous year's report [*loc. cit.*] was recorded ; this was *A. subpictus*, Grassi (*rossi*, Giles), which was found breeding in plantations in Krian in the harvest season.

HILDEBRAND (S. F.). **A Study of the Top Minnow, *Gambusia holbrooki*, in its Relation to Mosquito Control.**—*Pub. Health Bull.*, no. 153, 136 pp., 15 figs., 52 graphs. Washington, D.C., May 1925. [Recd. April 1927.]

Investigations were conducted in Georgia, during the summers of 1921 to 1924 with a view to obtaining accurate information on the actual value against mosquito larvae, under the widest range of conditions available, of *Gambusia holbrooki*, which is the species of top minnow in the Atlantic Slope region, *G. affinis* occurring in the Mississippi Valley. They showed that an average total reduction of 51·8 per cent. in the case of Anophelines and 80·8 per cent. in the case of Culicines may be brought about by the introduction of the fish into ponds or swamps constituting mosquito breeding grounds.

The most successful control by *Gambusia* was obtained by introducing the fish into an artificial pond that had previously contained no top minnow and had a bottom growth of *Myriophyllum*, which was later superseded by *Utricularia*. Here the average reduction compared with 1921 over the three succeeding years was 97 per cent. for Culicines and 75 per cent. for Anophelines, the heaviest decrease occurring among pupae and large larvae. Similar treatment of various temporary swamps was less successful owing to the protection afforded to the larvae by vegetation, though a considerable reduction took place. Although complete control was not secured by introducing additional minnows into ponds already stocked with the fish, the reduction effected was large enough to be significant. It appeared from the experiments that Culicine breeding decreases more rapidly in cool weather and toward autumn than Anopheline breeding, and the Culicines in general are less successful than the Anophelines in escaping from the minnow.

A series of experiments was carried out to determine the degree of protection against *Gambusia* afforded by various types of vegetation. Observations in pond areas entirely cleared of vegetation showed complete absence of mosquito larvae, even when *Gambusia* was not present, until vegetation reappeared. *Hydrochloa carolinensis* is the most

important plant of a protective type. Scattered growths of this grass were observed to harbour more larvae and pupae than dense ones, so that better control by *Gambusia* is secured by leaving them undisturbed. Sparse growths of *Potamogeton diversifolius*, another plant affording excellent protection to larvae, were found to be more favourable to control than dense growths. In spite of the reputed antagonism of *Utricularia* to mosquito production, a number of bladders of *U. macrorhiza* taken from a fishless pond containing numerous mosquito larvae of all sizes revealed an entire absence of larvae under microscopic examination [*cf. R.A.E.*, B, xv, 66, etc.]. Both this species and *U. radiata* were found to afford considerable protection to mosquito larvae. *Myriophyllum* affords protection in shallow ponds where it reaches the surface and in deeper ponds when it becomes detached and floats, forming a nucleus for algae and debris. While filamentous algae are bright green they are favourable to mosquito breeding, but as the mats grow older and darker they become less attractive. Other plants of less importance that occasionally afford protection are *Paspalum distichum*, *Naias flexilis*, *Chara fragilis*, *Polygonum* spp. and *Sacciolepis striata*. The only plant that was found to prevent mosquito breeding was the duckweed, *Lemna* (*Spirodela*) *polyrrhiza*; it was observed that mosquitos do not breed in places containing a practically continuous coat of this weed. The minnows were found to be effective in controlling Culicines and Anophelines in ponds where pine needle floatage had been deposited. The latter provided inadequate protection for mosquito larvae owing to the short time it remained afloat. In a ditch polluted by sewage water that had been treated with a commercial disinfectant as a larvicide, mosquito breeding continued but the fish died, although when oil was used instead of the disinfectant, the fish survived and controlled the mosquito larvae.

A further series of experiments, carried out to discover by means of enclosing a small area of a pond well stocked with *Gambusia* the proportion of immature mosquitos that reach the adult stage, indicated that Anopheline production was little in excess of 2·75 per cent. of the number of larvae and pupae present while the percentage for Culicines was probably lower. It was noticed that mosquito larvae shifted from place to place within the pond, probably at night when they would escape the vigilance of the minnows.

An increase in the water level brought about by heavy rain sufficient to submerge all vegetation resulted in almost complete elimination of mosquito breeding until readjustment took place. Where the vegetation was only partly submerged by rain, concentration round the remaining water-plants occurred, though it is probable that the total number of larvae and pupae actually present was smaller, particularly as the minnows are exceptionally active after rain. A constant water-level is thus conducive to maximum mosquito breeding both in fishless areas and in those stocked with *Gambusia*.

Instructions are given for the catching, transporting and handling of *Gambusia*.

HEADLEE (T. J.) & MILLER (F. W.). **Report of Mosquito Work.**—*Rept. New Jersey Agric. Expt. Sta. 1924–25*, pp. 433–442, 3 figs., 1 ref. New Brunswick, N.J., 1926. [Recd. April 1927.]

Studies of waters in which mosquito larvae do not ordinarily breed carried out by W. Rudolfs in 1923–24, a summary of which is given,

have been noticed from another source [*R.A.E.*, B, xiii, 25]. Natural alkalinity such as appears in sea-water was found to be directly destructive to mosquito larvae, but different amounts were required to prove lethal to different species [*cf. R.A.E.*, B, iv, 123]. Disregarding temperature, which must be above 55° F., the prime limiting factor in mosquito breeding in fresh waters is food supply, although mechanical movements of the water may prevent successful breeding even when the food supply in the waters is adequate to support larval life. In salt marsh waters toxic materials that occur naturally in sea-water are the primary factor.

In 1924–25 further studies were made by W. Rudolfs to discover the relation between breeding-places and the kind of food present, and between the kind of food and the chemical composition of the water. It was found that mosquito larvae fed indiscriminately, though large pieces of material, if too hard to be crushed, were rejected even if otherwise a good source of food.

About 114,000 acres of more or less completely drained salt-marsh and 320,000 acres of upland were kept under constant observation in 1924, supplementary ditching and larvicides being used to prevent the emergence of broods of mosquitos, which have consequently become very scarce. It is believed, however, that they would promptly reappear if vigilance were relaxed.

WILLIAMS, jr. (L. L.). **Effects of Pond Control on Malaria Prevalence.**—*Pub. Health Bull.*, no. 156, pp. 56–64. Washington D.C., August 1925. [Recd. March 1927.]

Observations in Virginia during the past seven years support the generally accepted theory that *Anopheles quadrimaculatus* is responsible for the bulk of the malaria in that State. Of a total of 556 Anophelines taken in houses, 524 were *A. quadrimaculatus*. It does not readily breed in running water, and weekly inspections indicated a marked preference for ponds as breeding-places.

It was found that Anopheline breeding can be controlled by causing the surface level of the water to fluctuate at proper intervals, and that the control of pond breeding controls malaria in Virginia. In the discussion that followed it was pointed out that dragging operations must supplement fluctuation where heavy central floatage is present.

SHAW (F. R.). **Effect of Temperature on Aquatic Life in Cisterns.**—*Pub. Health Bull.*, no. 156, pp. 65–71. Washington, D.C., August 1925. [Recd. March 1927.]

Investigations suggested by a previous observation of mosquito larvae withstanding higher temperatures than *Gambusia affinis* showed that this minnow and some turtles are able to withstand water temperatures of from 96° F. to 100° F. The musk turtle ate mosquito larvae, but less rapidly than the minnow, growing less eager for food in cooler weather. The river turtle declined to eat the larvae, and they accumulated to great numbers in its presence. The observations were made from July till October with occasional replenishment of the supply of larvae, all three animals living during that period without other food, in metal barrels painted red and exposed to the sun,

in which a higher temperature was attained than would ever be encountered in metal cisterns. Various methods for reducing temperatures in metal cisterns are suggested, and the relative merits of metal and wooden ones are discussed.

In the discussion that followed it was stated that the control of mosquitos as a whole is driving Anophelines to breed in cisterns, though the environment is not naturally favourable. Although there has been a considerable increase in Anopheline breeding in cisterns, the larvae are still far from numerous in such receptacles. While the screening of metal cisterns is recommended, the screening of wooden cisterns is considered impracticable. Details of reinforced concrete tanks are given. The ability of *Gambusia* to withstand extreme cold in Illinois is pointed out.

MAYNE (B.). **Dispersal of Male *Anopheles* from Breeding Areas.**—*Pub. Health Bull.*, no. 156, pp. 107–109. Washington, D.C., August 1925. [Recd. March 1927.]

A rough estimate of mosquito reduction can be obtained by making a survey of male mosquitos before and during the administration of control measures. A sharp reduction of males, which in the case of Anophelines are in a majority of three to one, indicates that eradication is advancing satisfactorily. The proximity of the breeding area may be gauged by the predominance of males, particularly in the case of *Anopheles punctipennis* and *A. crucians*, and if they are still present after a few weeks, it may be assumed that sufficient breeding-places remain to warrant attention.

BRUG (S. L.). **Technische wenken voor het verzamelen van muskieten.** [Technical Hints on the Collection of Mosquitos.]—*Geneesk. Tijsdchr. Ned.-Indië*, lxvii, no. 1, pp. 12–20. Weltevreden, 1927.

Directions are given for the collection, packing and preparation of specimens of mosquitos in all stages.

DOORENBOS (W. B.). **Zijn de muskieten, die malaria onderhouden, abnormaal levende exemplaren ?** [Are the Mosquitos that maintain Malaria Individuals that live abnormally ?]—*Geneesk. Tijdschr. Ned.-Indië*, lxvii, no. 1, pp. 21–27. Weltevreden, 1927.

Observations in England, chiefly with *Anopheles maculipennis*, Mg., have suggested the possibility that malaria is transmitted by abnormal mosquitos to which life indoors with a nightly feed of blood has become a habit, but it is very doubtful whether this could be the case in the tropics [*R.A.E.*, B, xiv, 207, 208]. In this paper catches made in the Dutch East Indies are discussed. Many of the malaria carriers are rare indoors, particularly *A.* (*Neomyzomyia*) *leucosphyrus*, Dön. The suggestion that malaria may be controlled by measures against mosquitos in houses is clearly inapplicable to the tropics, probably because the construction of the houses permits mosquitos to enter and leave with ease. In the case of *A. hyrcanus* var. *sinensis*, Wied., however, which is a species of domestic habits, the capture of adults indoors may be of great value. Before applying control in houses to tropical work it is therefore necessary to investigate the local carrier and its habits. As tropical experience does not indicate that it is abnormal individuals

that maintain malaria, it is difficult to conceive that this is the case with *A. maculipennis*, the theory being probably due to the fact that the latter happens to be a typical house-mosquito and that the construction of houses impedes the exit of mosquitos.

BORDEN (W.). *Anopheles* **Mosquitoes and Malaria at Eastern Army Stations.**—*Military Surgeon*, lix, no. 4, pp. 452–469. Washington, D.C., October, 1926. (Abstract in *Pub. Health Repts.*, xlii, no. 10, pp. 672–673. Washington, D.C., 11th March 1927.)

This is a review of the literature explaining the relative importance of the three common Anopheline malaria carriers in the United States, with reports of malaria incidence and mosquito prevalence at 15 stations along the Atlantic Coast. The indications are that *A. quadrimaculatus*, Say, is the principal vector of malaria.

HOWARD (L. O.). **Mosquito Work throughout the World.**—*Amer. Jl. Pub. Health*, xvi, no. 12, pp. 1210–1214. New York, December 1926. (Abstract in *Pub. Health Repts.*, xlii, no. 10, pp. 673–674. Washington, D.C., 11th March 1927.)

It is pointed out that mosquitos, when present in great abundance, are not only important with regard to health, but also have considerable effect on property values and general economic prosperity. Since the salt-marsh mosquitos of New Jersey have been kept under control, the State is far richer in the taxable value of the coastal land, and the resorts have greatly increased in prosperity. This is largely the result of engineering methods, and it is suggested that such work should be undertaken by engineers and sanitarians in close co-operation with entomologists.

MCDONALD (W. M.). **Preventable Diseases and their Effect on the Labor Supply.**—*Coll. Pprs. Trop. Dis.*, Govt. Printing Office, Leeward Is., Antigua, B.W.I., 1920. (Abstract in *Pub. Health Repts.*, xlii, no. 10, pp. 674–675. Washington, D.C., 11th March 1927.)

Malignant tertian malaria is gaining ground in Antigua, and if infection is allowed to go on unchecked the problem will become serious. The author points out the necessity of beginning control work on the Anopheline breeding-places even on a small scale.

STAMPAR (A.). **Malaria in the Kingdom of the Serbs, Croats and Slovenes.**—*League of Nations Health Organisation*, C.H. 326, pp. 26–36. (Abstract in *Pub. Health Repts.*, xlii, no. 10, pp. 676–677. Washington, D.C., 11th March 1927.)

This is a general discussion of the malaria problem in Jugoslavia, with a report on the control measures adopted since the War. A definite programme of control has been followed since 1923.

Studies of the Malaria Problem in Porto Rico.—*Porto Rico Health Rev.*, ii, no. 5, pp. 22–28. November 1926. (Abstract in *Pub. Health Repts.*, xlii, no. 13, p. 879. Washington, D.C., 1st April 1927.)

This paper deals with the influence of vegetation and small fish on mosquito production. Grasses grow rapidly in the ditches and larger

water-courses, thus presenting one of the biggest problems in mosquito control in Porto Rico. The value of the common fish found in small streams and ditches is considered questionable.

Van Hovenberg (H. W.). **How the Cotton Belt Railway cut Malaria Rate Ninety-seven per cent. in Nine Years.**—*Railway Eng. & Maintenance*, xxii, no. 10, pp. 382–390. Chicago, Ill.,1926. (Abstract in *Pub. Health Repts.*, xlii, no. 13, pp. 878–879. Washington, D.C., 1st April 1927.)

The work of the sanitary engineering department of this railway is reviewed. The anti-malaria programme included the eradication of mosquitos by draining and oiling, proper screening of living quarters, quinine prophylaxis and educational campaigns. The number of malaria patients admitted to hospital has been reduced from 100 per 1,000 in 1917, to 3 in 1925.

LePrince (J. A.). **Why we do not eliminate Malaria more rapidly.**—*New Orleans Med. & Surg. Jl.*, lxxix, no. 6, pp. 420–422. New Orleans, La., December 1926. (Abstract in *Pub. Health Repts.*, xlii, no. 15, p. 1063. Washington, D.C., 15th April 1927.)

This is an appeal to health officers in the southern United States for greater effort in the work of malaria control, the author pointing out that malaria control was accomplished in the Panama Canal Zone and that it can also be effected in the southern States.

[Popov (S. P.) & Shapshev (K. N.).] **Попов (С.П.) и Шапшев (К.Н.). The Question of the Transmission of Malaria by Lice.** [*In Russian.*] —*Profilakt. Med.*, 1925, no. 11, reprint 4 pp. [Kharkov] 1925. [Recd. April 1927.]

In view of previous observations on lice as a reservoir from which mosquitos might become infected with malaria [*R.A.E.*, B, xii, 77] a series of experiments was made. The lice [*Pediculus humanus*, L.] were allowed to feed on malaria patients and were then dissected at varying intervals after feeding. It was found that at 12–15° C. [53·6–59° F.] the gametes ingested by the louse begin to degenerate 1 hour after feeding and that after 3–4 hours as a rule they have all been destroyed, apparently owing to the action of digestive juices. At 37° C. [98·6° F.] degeneration occurs sooner and is completed within 3 hours.

Lischetti (A. B.). **Experiencias sobre la acción de substancias tóxicas sobre mosquitos adultos.** [Experiments on the Action of toxic Substances on adult Mosquitos.]—*Rev. Soc. ent. argent.*, i, no. 2, pp. 29–32. Buenos Aires, 31st December 1926. [Recd. April 1927.]

This paper is substantially the same as one already noticed from an abstract [*R.A.E.*, B, xv, 72]. At short distances mosquitos become aware of the presence of a honey-bait, and the females feed on the honey without waiting for an opportunity to suck blood. Poisoned females do not succeed in ovipositing. Mosquitos, attracted by a caged guineapig, fed on poisoned honey smeared on the gauze of the cage.

GALLIARD (H.). **Note sur les Culicinés de Corse.**—*Ann. Paras. hum. & comp.*, v, no. 2, pp. 97–104, 7 figs., 6 refs. Paris, 1st April 1927.

This list of 14 Culicines from Corsica is the result of collections made in 1925 and 1926 and includes notes on their seasonal occurrence and local distribution.

OKADA (Jô K.). **Un cas nouveau de myiase du tube digestif causé par la larve de** *Psychoda b. punctata* **Curt.**—*Ann. Paras. hum. & comp.*, v, no. 2, pp. 105–106. Paris, 1st April 1927.

A case of gastric myiasis due to *Psychoda b. punctata*, Curt. [*sic*, *? sexpunctata*] is recorded from Japan. The patient, a girl of 17, vomited living larvae, the infestation having been presumably due to the ingestion of eggs on some food. It is pointed out that the larvae of *Psychoda* are capable of development in water pipes.

ROBERTS (J. I.). **The Anatomy and Morphology of** *Hippobosca equina*. —*Ann. Trop. Med. & Paras.*, xxi, no. 1, pp. 11–26, 2 pls., 12 refs. Liverpool, 25th March 1927.

The anatomy and morphology of *Hippobosca equina*, L., are dealt with at length. This fly is usually associated with horses, but the specimens under consideration were obtained from cattle in south Carnarvonshire.

ARCHIBALD (R. G.). **The Tsetse Fly-belt Area in the Nuba Mountains Province of the Sudan.**—*Ann. Trop. Med. & Paras.*, xxi, no. 1, pp. 39–44, 1 pl., 1 map. Liverpool, 25th March 1927.

The area under discussion represents so far as is known the most northern fly-belt in the Sudan (latitude 11·31 to 11·52 N., longitude 30·21 to 30·30 E.). It is very limited and is infested with *Glossina morsitans*, Westw., which is probably responsible for animal trypanosomiasis due to *Trypanosoma pecaudi* and *T. congolense*, as both these trypanosomes have been obtained from the blood of horses.

The fly is confined to certain localities, which are apparently determined by the potential food-supply, consisting of the domestic animals of the natives. These are mainly goats and small pigs and to a less extent fowls, dogs, and a small race of cattle. The last stand only about 3 feet high and are believed to be immune from trypanosomiasis. The fly is apparently independent of water and finds shade among rocks, grass and trees. It is not known to attack man or enter the plains in search of food, but further observations are to be made during the rainy season to substantiate this.

ADLER (S.) & THEODOR (O.). **On a Collection of** *Phlebotomus* **sp. of the** *minutus* **Group.**—*Ann. Trop. Med. & Paras.*, xxi, no. 1, pp. 61–68, 1 pl., 1 fig., 2 refs. Liverpool, 25th March 1927.

The species dealt with include *Phlebotomus palestinensis*, sp. n. (female only), from Jericho; *P. parroti*, sp. n., from Algeria; and

P. shortti, sp. n., from Assam. The differentiation of these species is based on the diagnostic characters previously discussed [*R.A.E.*, B, xiv, 96].

Séguy (E.). **Faune de France. 13. Diptères (Brachycères) : Stratiomyiidae, Erinnidae, Coenomyiidae, Rhagionidae, Tabanidae, Oncodidae, Nemestrinidae, Mydaidae, Bombyliidae, Therevidae, Omphralidae.**—8vo, 308 pp., 685 figs., 10 pp. refs. Paris, Paul Lechevalier, 1926. Price *Frs.* 55. [Recd. March 1927.]

This monograph on certain families of Diptera Brachycera of France contains keys to the families, genera and species, with short general accounts of the morphology and biology of the families and genera. The distribution of each species is given, the adults and, so far as known, the larvae are briefly described, and the biology is indicated. In his treatment of the Tabanidae, the author has followed the classification of Enderlein [*R.A.E.*, B, xiii, 70], but he has dealt less fully with the species of this family than of others in view of the existence of Surcouf's recent monograph [*R.A.E.*, B, xiii, 183], and has in most cases omitted descriptions.

Falcoz (L.). **Faune de France. 14. Diptères Pupipares.**—8vo, 64 pp., 76 figs., 5 pp. refs. Paris, Paul Lechevalier, 1926. Price *Frs.* 12.50. [Recd. March 1927.]

In the introduction to this monograph on the Diptera Pupipara of France the author discusses the external and internal morphology and bionomics of the Hippoboscidae, Streblidae and Nycteribiidae, and expresses the opinion that these families do not constitute a natural group, their similarity being due to convergence and not to common origin.

Some species of Hippoboscids, such as *Melophagus ovinus*, L., on sheep, and *Stenopteryx hirundinis*, L., on swallows, are confined to a single species of host, while others, such as *Hippobosca equina*, L., which occurs on horses, oxen, dogs and other animals including birds, have several hosts. The Streblids and Nycteribiids, which usually parasitise bats, often attack several species, and several species of parasite may be found on a single bat ; this is possibly due to the fact that different species of gregarious bats may be found closely associated.

Keys are given to the three families and to the genera and species that occur in France ; the adult of each species is described with particulars of its hosts and distribution.

Howard (L. O.). **The Needs of Medical Entomology.**—*Amer. Nat.* lxi, no. 673, pp. 173–179. Lancaster, Pa., March–April 1927.

It is essential for the future progress of medical entomology to make provision for increasing the number of properly trained workers and the opportunities for research, which should be extended to the study of insects related to those already proved to carry disease, and to arrange for the correlation of results. For this purpose a centralised foundation should be established where a general scheme could be elaborated for covering the whole field of possibilities, and which should have enough funds to finance all investigations that bear on the subject.

Pessoa (S.) & Corrêa (C.). **Notas sobre os *Oxyurus* parasitas das baratas domesticas, com a descripção de uma nova especie: *Oxyurus australasiae* n. sp.** [Notes on the *Oxyurus* of the Cockroach, with the Description of a new Species, *O. australasiae*.]—*Mem. Inst. Butantan*, iii, pp. 71–76, 3 figs., 4 refs. São Paulo, 1926. (With a Summary in French.) [Recd. April 1927.]

The authors discuss the Nematodes of the genus *Oxyurus* that are parasitic in cockroaches and describe *O. australasiae*, sp. n., from *Periplaneta australasiae*, F. It has been considered in the past that there is a close relation between the number of Nematodes occurring in an insect and the number of infusoria, and that every Nematode has as a commensal a particular species of infusoria. This is not always true in the case of cockroaches as the authors have found these insects containing either Nematodes or infusoria alone.

Brazil (V.). **A defeza contra a mosca.** [Protection against Flies.] —*Mem. Inst. Butantan*, iii, pp. 189–203, 39 refs. São Paulo, 1926. (With a Summary in French.) [Recd. April 1927.]

Various methods that have been recommended for dealing with flies [*Musca domestica*, etc.] breeding in manure heaps are reviewed [*R.A.E.*, B, ii, 71; iii, 197; xiv, 25]. Mixing dry earth with the manure, in the proportion of 50 to 100, is an excellent means of destruction, since the mixture prevents movements of the larvae indispensable to feeding. The application of this treatment to human excreta has not yet been successful, owing to the difficulty of making a homogeneous mixture.

[Perfil'ev (P. P.).] **Перфильев (П.П.). On the Anatomy of *Phlebotomus* (Diptera).** [*In Russian.*]—*Rev. russe Ent.*, xx, no. 3–4, pp. 308–319, 7 figs., 12 refs. Leningrad, 1926. (With a Summary in German.) [Recd. April 1927.]

The material used in these studies was obtained from Transcaucasia and consisted mainly of *Phlebotomus papatasii*, Scop., though a number of *P. sergenti*, Parrot, and a few individuals of *P. perniciosus*, Newst., were included. The digestive tract, salivary glands and sexual organs are described, some of the details differing from those recorded by previous authors. The genitalia are of great systematic importance, particularly in the females.

Aragão (H.). **Palestra sobre Leishmanioses.** [A Discussion on Leishmaniasis.]—*Sciencia med.*, v, no. 3, pp. 121–132, 3 figs., 3 pls. Rio de Janeiro, 31st March 1927.

This discussion on leishmaniasis surveys the various forms of the disease, the organisms causing them, and their transmission. American leishmaniasis, caused by *Leishmania brasiliensis*, has been considered in Brazil to be a disease of rural districts, but an outbreak recently occurred in Rio de Janeiro near a wooded and damp area, the arrival of a case of leishmaniasis being followed by the infection of some fifty people. Sandflies (*Phlebotomus*) abound in this area, but as the disease disappeared following treatment of the cases, the parasite is apparently not normally harboured by these sandflies.

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). **Transmission Experiments in Indian Kala-azar with** *Phlebotomus argentipes*.—*Ind. Jl. Med. Res.*, xiv, no. 3, pp. 589–600, 3 refs. Calcutta, January 1927.

In these experiments, the technique of which is described, the sandflies, *Phlebotomus argentipes*, Ann. & Brun., were fed on cases of kala-azar showing parasites in their peripheral blood and were subsequently kept at a temperature of 28° C. [82·4° F.]. As previous observations have indicated that the third and subsequent feeds are the ones most likely to be infective, the flies were given a second feed (about 3–4 days after the first, when they had deposited eggs) on the same or another kala-azar case. As, however, the infection of the pharynx is not uncommon after the first feed, the possibility of transmitting the infection during the second feed was tested by allowing some of the flies to take this meal on experimental animals such as mice or rabbits, the latter being the more convenient. The third and subsequent feeds were always on experimental animals, which were either mice or the Chinese hamster (*Cricetulus griseus*).

The details of the experiments are shown in tables. In some cases the sandflies were not infected, and in others their condition was not demonstrated; but 60 animals were subjected to 184 bites from a minimum of 152 flies shown by subsequent examination to be infected with *Leishmania donovani*, and none of them developed the disease. With the exception of three, each of the hamsters had from 3 to 15 flies feeding on it. These animals may therefore be said to have been submitted to at least the maximum degree of exposure to infection by the bite of a sandfly that is ever likely to occur in nature in the case of man over the same limited period of time.

Hindle (E.) & Patton (W. S.). **Sand-flies and Chinese Kala-azar.**—*Nature*, cxix, no. 2995, p. 460. London, 26th March 1927.

A female hamster (*Cricetulus griseus*) was inoculated intraperitoneally with saline suspension of the midgut contents of five infected *Phlebotomus sergenti* var. [*R.A.E.*, B, xv, 41] that had been fed three days previously on a hamster infected with the parasite of Chinese kala-azar. The sandflies had been kept at a temperature of 30° C. [86° F.], and of those dissected after a three-day interval, six out of eight contained flagellates in the midgut. The hamster died about five months after inoculation, the spleen being moderately enlarged. Films made from the spleen, liver and bone-marrow contained enormous numbers of parasites.

The experiment supports the hypothesis that sandflies are responsible for the transmission of the parasite of this disease.

Sunder Lal Hora. **The Mechanism of the so-called "Posterior Sucker" of a** *Simulium* **Larva.**—*Nature*, cxix, no. 2999, pp. 599–600, 1 fig. London, 23rd April 1927.

The manner in which a larva of *Simulium* fixes itself to rocks and water-weeds in very rapid streams is discussed. Various theories have been put forward. As a result of a close study of the habits of these larvae, the author has been led to the conclusion that the posterior appendage does not act as a sucker, but that the insect is fixed with

the help of the hooks alone. These are capable of gripping firmly a cluster of silk threads that the larva secretes on the spot to which it intends the posterior appendage to be fixed.

Pulikovsky (N.). **Die respiratorischen Anpassungserscheinungen bei den Puppen der Simuliiden (und einigen anderen in schnellfliessenden Bächen lebenden Dipterenpuppen).** [Respiratory Adaptation in the Pupae of Simuliids and of other Diptera living in swift-running Brooks.]—*Zeitschr. Morph. u. Oekol. Tiere*, vii, no. 3, pp. 384–443, 31 figs., 43 refs. Berlin, 17th March 1927.

In the case of Simuliids and Blepharocerids, cuticular gills in the pupae are, in the author's opinion, an adaptation of the insect to breathing in the conditions of life pertaining to existence in swift mountain brooks, which are liable to be at one time in flood and at another dried up.

Johnson (C. W.). **Dipterological Notes.**—*Psyche*, xxxiv, no. 1, pp. 33–34. Boston, Mass., February 1927.

From an abandoned bluebird's nest in Massachusetts 154 larvae and pupae of *Phormia* (*Protocalliphora*) *splendida*, form *sialia*, Shannon & Dobroscky, were obtained. These undoubtedly cause the death of many nestling birds Seventeen of the pupae were parasitised by the Chalcid, *Mormoniella brevicornis*, Ashm. A number of the Hippoboscids, *Ornithoponus americanus*, Leach, and *Ornithoica confluens*, Say (*confluenta*, Say), were taken on a great horned owl (*Bubo virginianus*). Records of *Muscina pascuorum*, Mg., show that males predominate in late summer and early autumn, the females seeking in October buildings in which to hibernate.

Brown (F. M.). **Descriptions of New Bacteria found in Insects.**—*Amer. Mus. Novit.*, no. 251, 11 pp. New York, N.Y., 21st February 1927.

An account is given of several new bacteria obtained from various insects, including *Bacillus lutzae*, which probably caused the death of adults of *Lucilia sericata*, Mg., in New Jersey, and *Micrococcus rushmorei* and *Neisseria luciliarum* from flies killed by *B. lutzae*. The last named was found to be pathogenic to house-flies [*Musca domestica*, L.].

Moutia (A.). **La mouche domestique**—*Musca domestica* **(Linn.).**—*Rev. agric. Ile Maurice*, no. 26, pp. 66–68. Mauritius, March-April 1926. [Recd. April 1927.]

A short and popular account is given of the life-history and habits of *Musca domestica*, L., and *Stomoxys nigra*, Macq. The importance of destroying the house-fly and protecting food from contamination is pointed out, and formulae for the preparation of a sticky fly paper and a poison-bait are given, the latter containing milk, formol, water and sugar.

The formula recommended for the protection of animals from the attack of *S. nigra* is almost identical with one already noticed [*R.A.E.*, B, ix, 166].

Simmons (P.). **The Cheese Skipper as a Pest in Cured Meats.**—*U.S. Dept. Agric.*, Dept. Bull. 1453, 55 pp., 1 pl., 10 figs., 83 refs. Washington, D.C., January 1927.

An account is given of the life-history and habits of *Piophila casei*, L. (cheese and ham skipper) [*R.A.E.*, A, xv, 324], which has been recorded in medical literature as causing myiasis in the intestines of persons who had eaten infested cheese.

Holdaway (F. G.). **A Note on the Occurrence of the Rat Mite, *Liponyssus bacoti*, in South Australia, together with Descriptions of certain Stages.**—*Trans. & Proc. R. Soc. S. Aust.*, l, pp. 85–88, 1 fig., 6 refs. Adelaide, December 1926. [Recd. April 1927.]

Liponyssus bacoti, Hirst, is recorded for the first time from South Australia, where assistants in a shop where rats (*Mus norvegicus*) were prevalent complained of being bitten by the mites. *M. norvegicus* is apparently the principal host, though the mite has also been found on *M. rattus* and *Acomys cahirinus* in Egypt. Apparently no ill effects have been noticed beyond irritation and inflammation. The reason why the mites leave the rats in such numbers as to become an annoyance to man is not known. The egg and larval stages of the mite are described. The larva moults before feeding, and the protonymph has been known to remain alive in a glass tube without food or moisture for 8 days in hot weather.

Rat Mites in a Lecture-room.—*Farming in S. Africa*, i, no. 2, p. 61. Pretoria, May 1926. [Recd. March 1927.]

A lecture-room at the Grootfontein School of Agriculture (Cape Province) was severely infested with *Liponyssus bacoti*, Hirst (rat mite), which caused much discomfort to the students. No source of infestation could be found, and it is thought that the mites had migrated from the nests of rats that had been exterminated more than twelve months previously.

Harris (R. H.). **Tsetse Fly in Zululand. Control Methods tried by felling Trees.**—*Farming in S. Africa*, i, no. 2, pp. 58–60, 9 figs. Pretoria, May 1926. [Recd. March 1927.]

An experiment was begun in 1924 in Zululand to determine the distance that *Glossina pallidipes*, Aust., will travel across open grassland in search of food. A belt about 50 yards wide was cleared all round an oval-shaped area of bush covering about 4–5 acres and known to be regularly frequented by the flies; the felled trees were drawn to the outer edge of the clearing to form a barricade to exclude game; subsequently the cleared belt was extended to a width of 100 yards all round the central area of bush. *G. pallidipes* was, however, found regularly in the isolated bush, where there was no food supply, the presence of small animals being considered of little importance, and where it was impossible that all the flies taken daily for 16 months could have emerged from puparia deposited previously, as the longest period between the generations in the coldest month is approximately 84 days; moreover, several of the flies captured showed proboscis infection with trypanosomes reasonably regarded as obtained from wild animals in the surrounding bush.

Early in 1925 clearing outside the original area was begun, trees being felled for a further 300 yards all round, except for four narrow blocks on the north, south, east and west ; the trees in the additional area were left lying on the ground. Flies continued to arrive daily in the isolated bush, although in diminished numbers, but could always be found more commonly in the blocks left standing, which formed extensions of the bush into the cleared area. Finally these four blocks of trees were felled, the last in February 1926. The immediate result of this was an increase in the average daily catch of flies in the isolated area from 2·96 in January to 6·3 during the felling operations with a gang of nine natives, and 5·3 for the month of February, the increase being apparently due to the presence of the natives. It was previously noticed that the catch rose when game was known to be grazing near the margin of the cleared area. The flies search for food among the felled trees, but in smaller numbers than in the surrounding standing ones.

The number of *G. pallidipes* caught in the isolated bush area was greatest at its southern extremity, where the tallest and most conspicuous trees occur. This seems to support a suggestion previously made by the author, that the flies take their direction by the most conspicuous object, or that throwing the most conspicuous shade, within their range of vision ; should this prove to be the case, it will only be when the isolated central bush falls below the visional horizon of the flies hunting in the surrounding trees that they will cease to visit it.

[Smit (Bernard) & du Plessis (S.).] **Distribution of Blow-flies in South Africa. Species that attack Sheep.**—*Farming in S. Africa*, i, no. 8, pp. 262–263. Pretoria, November 1926.

One of the first steps in the investigation of sheep blow-flies that is being made at the Grootfontein School of Agriculture was to determine the species that attack living sheep, and their geographical and seasonal distribution in South Africa. Farmers in different parts of the country were asked to send to the School flies caught in traps and maggots removed from sheep ; the latter were reared on meat and the flies were bred out. Most of the catches of blow-flies from traps in fifteen localities in the Union and two in South-west Africa comprised eleven species, which are enumerated, but only three species were reared from the maggots taken from living sheep, *viz. Chrysomyia chloropyga*, Wied. (green and blue sheep blow-fly), *C. albiceps*, Wied. (banded sheep blow-fly), which was much the least common, and *Lucilia sericata*, Mg. (English sheep blow-fly).

All these three blow-flies were represented in every collection of flies caught in traps, and thus appear to be distributed over the whole of South Africa. In the spring *C. chloropyga* is the most abundant species in the Cape Province and the Transvaal, but at Windhoek and Keetmanshoop, in South-west Africa, *L. sericata* and *C. albiceps* are respectively the most abundant. Elsewhere, however, *C. albiceps* does not appear until about the beginning of January. In the Cape Province the proportion of *L. sericata* increases as the season advances, especially in the eastern districts. The records of the flies taken in the traps at Grootfontein from July 1924 to June 1925 show that *C. chloropyga* and *L. sericata* occurred throughout the year, although from June to

August the temperature often fell below 25° F. ; the numbers of these two species increased very rapidly in the spring, during September and October, reaching their maximum in November, when *C. chloropyga* was much the more abundant ; the numbers of *C. albiceps* increased in January, but were not nearly so great as those of either of the others. All three species decreased in numbers during February, almost disappearing by the end of the month, probably on account of the heat, the temperature often rising above 95° F. After February the numbers again increased, the autumn maximum being reached in April, when *C. chloropyga* was still the commonest, although less abundant than in the spring, *C. albiceps* coming next. The periods of greatest abundance of the flies correspond closely with the periods during which sheep are most severely attacked. At Grootfontein many more flies were caught in traps set in damp, low-lying ground with good shelter than in those on the open veldt, but rainfall did not affect their abundance so much as was expected.

Ogura (K.) & Takada (K.). **The Ticks parasitic on Cattle and Horses in Hokkaido, Japan.**—*Jl. Coll. Agric., Hokkaido Imp. Univ.*, xviii, pt. 4, pp. 199–206, 5 pls., 5 refs. Sapporo, February 1927.

Piroplasmosis has been very prevalent for some years among cattle pastured in summer in parts of Hokkaido. An investigation of 7,000 ticks revealed the occurrence of the following five species, which are here described in some detail as there is no previous account of ticks in that region :—*Ixodes ricinus*, L., and *I. frequens*, sp. n., both taken from cattle, horses and man ; *Haemaphysalis concinna*, Koch, and *H jezoensis*, sp. n., from cattle and horses ; and *H. bispinosa*, Neum., from cattle, horses and hares.

Schwetz (J.). **Note sur les Ixodidae (Tiques) du Katanga.**—*Rev. zool. afr.*, xv, fasc. 1, pp. 65–72. Brussels, 1st April 1927.

A list is given of the ticks found in Katanga, together with notes on the distribution of the individual species. Those discussed are : *Argas persicus*, Oken, in a chicken house ; *Ornithodorus moubata*, Murr., in a pig-sty and in native dwellings (this species is widely distributed in the Belgian Congo and in Katanga in particular owing to the extensive movement of natives) ; *Ixodes rubicundus* var. *limbatus*, Neum., on cows, dogs and antelope, also attacking man at Elisabethville ; *Haemaphysalis leachi*, Aud., on cats and dogs ; *Rhipicephalus appendiculatus*, Neum., on cattle, antelope and a wild hare ; *R. sanguineus*, Latr., on cattle, dogs, cats and antelope ; *R. evertsi*, Neum., on cattle and sheep ; *R. capensis*, Koch, on antelope ; *R. falcatus*, Neum., on dogs and wart-hog ; *Boophilus annulatus decoloratus*, Koch, on cattle and sheep ; *Hyalomma aegyptium*, L., on cattle and pigs ; *Amblyomma variegatum*, F., on cattle, pigs and sheep ; *A. pomposum*, Dön., on zebra and antelope ; *A. petersi*, Karsch, on rhinoceros ; and *A. tholloni*, Neum., and *Dermacentor circumguttatus*, Neum., on elephant.

Amblyomma hebraeum, Koch, which transmits heartwater of sheep and cattle in South Africa, does not seem to occur in Katanga, though in Australia this disease appears to be transmitted by *A. variegatum*, which is common on cattle in this locality.

Schwetz (J.). **Contribution à l'étude des Ixodidae (Tiques) du Congo belge (2e et 3e notes).**—*Rev. zool. afr.*, xv, fasc. 1, pp. 73–92. Brussels, 1st April 1927.

These two papers deal with the ticks from various regions in the Belgian Congo identified by the author and Dr Larrousse from the collections of two museums in Brussels. The species dealt with are: *Argas persicus*, Oken, on cattle; *Ornithodorus moubata*, Murr.; *Ixodes rasus*, Neum., on hyrax and okapi; *Haemaphysalis leachi*, Aud., on domestic animals; *Rhipicephalus appendiculatus*, Neum., on dogs, cattle, antelope, bush pig and wart-hog; *R. sanguineus*, Latr., on dogs and okapi; *R. tricuspis*, Dön., on cattle; *R. capensis*, Koch; *R. evertsi* var. *albigeniculatus*, Warb., on cattle, horses, buffalo, and monitor lizard; *R. planus*, Neum., on bush pig; *R. sulcatus*, Neum.; *R. duttoni*, Neum. (of which the female was previously unknown), on cattle; *R. schwetzi*, Larr., on bush pig; *Boophilus* (*Margaropus*) *annulatus decoloratus*, Koch, on cattle and buffalo; *Dermacentor circumguttatus*, Neum., on elephant; *Amblyomma variegatum*, F., on cattle and horses; *A. splendidum*, Gieb., on cattle and buffalo; *A. tholloni*, Neum., on bush pig, elephant and a large lizard; *A. cohaerens*, Dön.; *A. cuneatum*, Neum., on *Manis*; *A. nuttalli*, Dön., on land tortoise; and *Aponomma exornatum*, Koch, on crocodile and monitor lizard (this being apparently the first record of a tick on a crocodile). *A. hebraeum*, Koch, was not found in either collection and must therefore be extremely rare. A list of ticks from the Belgian Congo previously identified by other authors is appended.

Rosenholz (H. P.). **Die Rolle der Wanzen in der Epidemiologie des Rückfallfiebers.** [The Rôle of Bugs in the Epidemiology of Relapsing Fever.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., cii, no. 4–5, pp. 179–213, 3 figs., 48 refs. Jena, 12th April 1927.

There is a conflict of opinion regarding the part played by bed-bugs in the spread of relapsing fever. The investigations here described in detail were made in Moscow, with strains of *Spirochaeta duttoni* and *S. recurrentis* (*obermeieri*), *Cimex lectularius*, and mice. The following conclusions are reached: Bed-bugs infected with either form of relapsing fever remain carriers of infection during a long period, perhaps during life. After the spirochaetes have reached the stomach of the bug, some of them at once penetrate through the stomach-wall into the haemolymph, where they find favourable conditions; there is no biological change in the spirochaetes in the bug. The number of bugs containing spirochaetes in the haemolymph depends chiefly on the degree of engorgement with infected blood. Such spirochaetes as fail to reach the haemolymph are destroyed in the stomach within a few days. Emulsions of the crushed bugs or of the haemolymph, rubbed into the scarified or depilated skins of mice, caused infection up to 62 days after the bugs were infected. Attempts to transmit the disease by the bites of infected bugs were unsuccessful.

Under natural conditions only a few individuals have spirochaetes in the haemolymph, but a method that ensures infection consists in puncturing the lower surface of the bug over the stomach, a capillary cannula being used, the withdrawal of which draws blood into the haemolymph, thus infecting it. Strains of spirochaetes may be maintained in bugs infected by this method instead of in laboratory animals. The excreta of infected bugs do not contain spirochaetes.

(K 3363) Wt.P2/D45 1,500 7/27 H & Sp Gp 52

GALLI-VALERIO (B.). **Beobachtungen über Culiciden, nebst Bemerkungen über Tabaniden und Simuliden.** [Observations on Culicids, with Remarks on Tabanids and Simuliids.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., cii, no. 4–5, pp. 224–226, 1 ref. Jena, 12th April 1927.

These notes of observations in Switzerland are of the same type as those in the preceding year [*R.A.E.*, B, xiv, 71]. At Vidy the development of Anophelines was hindered in some pools by the growth of *Lemna palustris*. Tabanids were scarce in Vaud and Valais, probably owing to heavy snow in spring. The larvae and pupae of *Simulium ornatum* and *S. gallii*, which inhabit waters flowing with strong currents, die if placed in standing water, even if it is changed very often.

[NOKHEIL (V.).] **Нохејл (В.). Contribution to the Study of Malaria in Macedonia.** [*In Serbian.*]—*Glasnik Cent. Hig. Zavoda*, i (1), pt. 1–4, pp. 95–119, 7 charts. Belgrade, 1926. (With a Summary in German.) [Recd. April 1927.]

The three forms of malaria, benign and malignant tertian and quartan, all occur in Southern Jugoslavia. *Anopheles maculipennis*, Mg., and *A. superpictus*, Grassi, are both present [*cf. R.A.E.*, B, xiv, 57]. Relapsing cases of benign tertian are numerous in April and May, and offer optimum conditions for the infection of the first generation of mosquitos ; the chronic cases are a source of benign tertian infection to mosquitos throughout the year and of malignant tertian during the second half of the year. Climatic and other conditions, including the prevalence of mosquitos and infective cases, are most favourable for the transmission of the disease towards the end of May and gradually become unfavourable about the end of October.

[BRAGINA (A.).] **Брагина (А.). The Biology of *Anopheles maculipennis*, Mg., with Introductory Notes by E. Junkovskiĭ.** [*In Serbian.*] *Glasnik Cent. Hig. Zavoda*, i, (1), pt. 1–4, pp. 119–145. Belgrade, 1926. (With a Summary in German.) [Recd. April 1927.]

A female of *Anopheles maculipennis*, Mg., lays on the average about 200 eggs. In captivity pairing occurs before feeding. It is possible to tell from the external appearance of the abdomen of the female whether it has already had a blood meal, the stage of development of the eggs, and the condition of the fat-bodies and therefore the probable approach of hibernation.

In the vicinity of Belgrade females were observed in the autumn of 1924 up to 10th October ; they had fed shortly before. In that year some of the individuals entered hibernation at the end of August, but the majority did so at the end of September. It is believed that the individuals beginning hibernation very early eventually succumb from starvation, as the provision of the fat-bodies must be exhausted during the warm days of the autumn.

An early interruption in the winter diapause does not cause any alteration in the development of the ovaries. The fact that the winter diapause is not correlated with any definite period and the impossibility of altering its duration so as to affect the development

of the ovaries are explained by the fact that only a constant number of generations of *A. maculipennis* can be maintained in a given locality. The fat-bodies are only considered to be supplies of nourishment for the individual female, which must therefore imbibe a meal of blood in the spring to promote the development of the ovaries. This question may be of importance with regard to the hibernation of the malaria parasite.

Newly hatched larvae of *A. maculipennis* feed on bacteria, which are no doubt also included in the food of the older larvae. Larvae of all stages except the first were found in early November in 1924.

[Yatzenko (F. I.).] **Яценко (Ф. И.). Some Observations on Hibernating Malaria Mosquitos, *A. maculipennis*, Mg., in 1925-26.** [*In Russian.*]—Med. Obozr. Nizhn. Povolzh. [*Med. Rev. Lower Volga*], 1926, no. 9–10, reprint, 5 pp. Astrakhan, 1926. [Recd. April 1927.]

The site chosen by *Anopheles maculipennis*, Mg., for hibernation is briefly discussed [*R.A.E.*, B, xv, 31]. The number of mosquitos taken hibernating is considered a valuable index of the potential malaria-carriers in the following spring. Observations have been made on the influence of temperature on the development of the eggs of overwintering mosquitos. This development varies in individuals; thus, of those dissected on 4th April 1926 some showed eggs in the process of development, others completely mature eggs, and others had them in the oviduct. The last-named were collected from warmer places than those with undeveloped eggs. It is possible that besides the part played by temperature there may be some relation between feeding prior to hibernation and the development of eggs.

Headlee (T. J.).—**Relation of Summer Rainfall to Mosquito Prevalence.** —*New Jersey Agric. Expt. Sta.*, Bull. 423, 14 pp., 7 figs. New Brunswick, N.J., December 1925. [Recd. April 1927.]

This is a reprint of a paper already noticed [*R.A.E.*, B, xiv, 88].

Hearle (E.). **Notes on the Occurrence of *Aëdes* (*Ochlerotatus*) *nearcticus* Dyar in the Rocky Mountains Park, Alberta (Culicidae Dipt.).**—*Canad. Ent.*, lix, no. 3, pp. 61–63, 2 figs. Orillia, Ont., March 1927.

Adults of *Aëdes nearcticus*, Dyar, were reared in 1922 from larvae collected in Alberta at a height of 7,000 ft. In 1924 and 1925 numerous specimens of larvae and adults of both sexes were taken. The points of difference between the larva of *A. nearcticus* and that of *A. alpinus*, L., which it closely resembles, are described and the characters of the adult of *A. nearcticus* are discussed. It is stated that there is no character of the male hypopygium by which it may be distinguished from *A. alpinus*. In a foot-note by E. H. Curran it is pointed out that in a previous article [*R.A.E.*, B, xv, 95] it was indicated that *A. nearcticus* is a synonym of *A. alpinus*. This is doubtful, the male genitalia showing differences that may be of specific value.

The occurrence of *A. nearcticus* is much localised in the mountains of Alberta. A small, shallow, weed-grown pool, which did not quickly

drain away, situated above 7,300 ft., close to a large evanescent sheet of water that contained no mosquitos, was found to be full of larvae, 90 per cent. of which were *A. nearcticus*. Only two other species were present, *A. pullatus*, Coq. (7 per cent.) and *Theobaldia alaskaensis*, Ludl. (3 per cent.). In 1925 the larvae in this pool were full-grown by 16th June, pupation taking place within the next few days and the main emergence of adults occurring on 24th June. By 4th July the pond had dried up, and a few adults were noticed on the wing, resting in willow clumps or attacking man. Other mountain pools examined contained only *A. pullatus*, or a small proportion of *A. nearcticus*, under similar conditions.

MARTINI (E.). **Malaria und Malariabekämpfung in der Türkei.** [Malaria and Malarial Control in Turkey.]—*Mitt. Dtsch.-Turkischen Ver.*, viii, no. 3, pp. 54-55. Berlin [1927[.

Malaria is rife in Anatolia, the severe tropical forms being widespread, especially in the warm lowlands in the west and south. Artificial water-holes and irrigation channels are the chief factors in the occurrence of the disease, as they afford breeding-places for *Anopheles maculipennis*, Mg., and *A. sacharovi*, Favr (*elutus*, Edw.). *A. superpictus*, Grassi, chiefly occurs in the hilly country. The Government is dealing with the problem, and at Angora and Konia very notable success has been achieved.

RITCHIE (A. H.). **Entomological Report, 1925–26.**—*Tanganyika Terr. Rept. Dept. Agric. 1925–26*, pp. 33–36. Dar-es-Salaam [1927].

During an outbreak of malaria in Morogoro the Anophelines reared were *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, *A. pretoriensis*, Theo., and *A. marshalli*, Theo. *A. costalis* was the most prominent species, breeding in riverside flood-water (grass-grown pools at an altitude of from 1,800 ft. to just under 4,000 ft.). The clearing of trees and bush from the banks of the river proved beneficial. *Aëdes argenteus*, Poir., was induced to breed in small tins suspended under the foliage of coconut palms and papayas. *Culex fatigans*, Wied., and *C. horridus*, Edw., were reared from two surface wells and from chance collections of water in paint cans, cesspits, etc.

The larvae causing myiasis in cattle have been identified as those of *Chrysomyia bezziana*, Vill.

[NIKANOROV (S. M.).] **Никаноров (С. М.). A new endemic Plague Centre in U.S.S.R.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 1, pp. 3–8, 1 map. Saratov, 1927. (With a Summary in French, p. 125.)

As a result of an outbreak of bubonic and pneumonic plague in the autumn of 1926 in Transcaspia, an expedition was organised and the results of its investigations are described. It is believed that a jerboa (*Rhombomys opimus*), the most abundant of the small rodents, is the reservoir of the disease. The original infection was probably intro-

duced from Turkestan by camel caravans, which may accidentally carry the rodents from place to place in their packs. A number of parasites (fleas and mites) were taken from the nests of the jerboas and found to harbour plague infection.

[Reĭnhard (L. V.) & Dolbeshkin (B. I.).] **Рейнгард (Л. В.) и Долбешкин (Б. И.). Investigation of *Anopheles* for Infection with Malaria Parasites in the Ekaterinoslav Area.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 1, pp. 9–18, 1 fig., 1 pl. Saratov, 1927. (With a Summary in English, p. 126.)

During 1924 and 1925 an examination was made of 6,294 Anophelines with a view to ascertaining the amount of malaria infection among them. The percentage of infection varies under different conditions; thus the proportion of infected mosquitos is naturally greater in the vicinity of man and during an epidemic of the disease. During 1924 as many as 20 per cent. of the mosquitos caught in houses were found to be infected. The method of examining the different parts of the mosquito for the presence of cysts and sporozoïtes is discussed, and the various formations likely to be mistaken for cysts are described. As a detailed knowledge of the forms occurring in the infected mosquito is essential for this work, it is advisable to use experimentally infected mosquitos for a study of the malarial parasites. All mosquitos fed on the same patient are not necessarily equally infected with sexual forms of the parasite; this may possibly be due to an unequal distribution of the parasites in the blood or some other unknown factor. The possibility of an unfavourable action of the saliva or of varying strength of the digestive action of the gastric juices is suggested.

The species of *Anopheles* recorded from Ekaterinoslav are *A. maculipennis*, Mg., *A. bifurcatus*, L., and *A. hyrcanus* var. *pseudopictus*, Gr. *A. maculipennis* is the most abundant, and as the greatest percentage of infected individuals was caught in houses, they are most likely to infect man at night. *A. hyrcanus* var. *pseudopictus* was never caught in either human or animal habitations, and as it is comparatively scarce, it is not considered of great importance in relation to malaria. *A. bifurcatus* is also not very abundant, and though it has been experimentally proved capable of transmitting malaria, it can only do so under natural conditions where a large number of people are collected in its forest haunts.

[Konovalova (S. F.).] **Коновалова (С. Ф.). The Fleas that inhabit the Nests of Ground Squirrels as Carriers and Reservoirs of Plague Infection.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 1, pp. 39–40. Saratov, 1927. (With a Summary in English, p. 128.)

An examination of 17 nests of ground squirrels in south-eastern Russia was made during 1926. Of 43 fleas captured in one nest 17 were *Neopsylla setosa*, Wagn., and 26 *Ceratophyllus tesquorum*, Wagn., while the fleas taken in other nests were mainly *N. setosa*, the importance of which in relation to plague is not yet known. Healthy ground squirrels were given an injection of an emulsion made from the fleas, but only the fleas from the one nest mentioned above gave positive results. This is the first record of the occurrence of naturally infected fleas in the nests of ground squirrels in south-east Russia.

[Semikoz (F. F.), Stepanov (V. F.) & Shmidt (B. N.).] **Семикоз (Ф. Ф.), Степанов (В. Ф.) и Шмидт (Б. Н.). Laboratory Data on the Action of Chloropicrin, Chlorine and Carbon Bisulphide as Disinfectants and Experiments to determine their Influence on the Insect Fauna in the Burrows of Ground Squirrels.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 1, pp. 41–68. Saratov, 1927. (With a Summary in English, pp. 128–130.)

This is a detailed account of laboratory experiments on the action of chloropicrin, chlorine and carbon bisulphide on ground squirrels, their ectoparasites and plague bacilli. The insects selected for experiment were cockroaches, bugs [*Cimex*] and fleas, and the cultures were made from rod-shaped plague bacilli. Of the materials used chloropicrin gave the best results, all insects and bacilli being killed after 24 hours exposure to a concentration of 0·0012 cc. per litre. At the strongest concentration tried, 0·019, all insects and bacilli were killed within half an hour. The insecticidal and disinfectant properties of chloropicrin are practically equal and are not affected by temperature or humidity within the range of fatal concentrations and exposure.

This substance was also the most effective when tried in the actual burrows of ground squirrels. It is necessary, however, to improve the method of application, as even with much higher doses than those used in the laboratory, positive results were only obtained in 22 per cent. of the burrows treated. The action of the gas depends on the speed with which it will penetrate through to the nests; in this connection atmospheric pressure, type of soil and the actual plan of the burrow have to be considered.

[Borzenkov (A. K.).] **Борзенков (А. К.). On the Survival of the Insect Fauna of the Burrows of Ground Squirrels poisoned with Chlorine and Carbon Bisulphide.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 1, pp. 69–71. Saratov, 1927. (With a Summary in English, p. 130.)

Burrows of ground squirrels in the Lower Volga region, which had all been treated with either chlorine or carbon bisulphide, were examined 3, 6 and 9 weeks after treatment. A total of 2,054 living insects, including 991 fleas, were taken from 53 burrows. The usual method of destroying these rodents is therefore not effective against their ectoparasites.

[Semikoz (F. F.), Maluisheva (A. I.) & Sherishorina (S. I.).] **Семикоз (Ф. Ф.), Малышева (А. И.) и Шеришорина (С. И.). The Disinfection of Dwellings and Clothes with Chloropicrin.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 1, pp. 72–81, 1 fig. Saratov, 1927. (With a Summary in English, pp. 131–132.)

As chloropicrin appears to be a satisfactory fumigant for the destruction of plague bacilli and insects likely to transmit the disease, experiments have been made to ascertain its effect on clothing and other articles. It is harmless to fabrics and metals even when used at high concentrations under conditions of maximum relative humidity. In the experiments described huts were successfully treated by applying the fumigant as a fine spray. The dosage should vary according to the permeability of the structure; under fairly air-tight conditions 19 cc.

of chloropicrin to a cubic metre will kill the eggs of fleas in 6 hours. Carbon bisulphide is less effective, and chlorine does not kill the eggs.

Details are given of a bag suitable for fumigating clothing. It is made of rubber and is hermetically sealed by means of clamps. At the opposite corners to the clamps small metal tubes are fixed, through which the liquid chloropicrin may be poured in, the tubes being immediately corked.

Olenev (N. O.). **A New Species of the Genus** *Dermacentor* **(Ixodidae).**—*Parasitology*, xix, no. 1, pp. 84–85, 1 pl., 1 fig. Cambridge, March 1927.

Dermacentor pavlovskyi, sp. n., from the head of a wild sheep (*Ovis nigrimontana*) is recorded from Turkestan.

Theiler (Sir A.) & du Toit (P. J.). **The Transmission of Tick-borne Diseases by the Intrajugular Injection of the Emulsified Intermediary Host itself.**—*S. Afr. Jl. Sci.*, xxiii, pp. 609–619. Johannesburg, December 1926. [Recd. April 1927.]

This paper has already been noticed from another source [*R.A.E.*, B, xv, 29].

Fourie (P. J. J.). **A Case of Demodectic Mange in the Goat.**—*S. Afr, Jl. Sci.*, xxiii, pp. 760–763, 3 figs., 6 refs. Johannesburg. December 1926. [Recd. April 1927.]

A case of demodectic mange in a goat caused by *Demodex folliculorum*, Simon, is reported for the first time from South Africa. It is suggested that infection resulted from contact with infected pigs. A few measurements indicate that the parasites in the goat vary very slightly in size from those of the pig.

Sauberzweig (—). **Die Schlammkrankheit.** [The "Schlamm" [Mud] Fever.]—*Abh. naturf. Ges. Görlitz*, xxx, no. 1, pp. 131–132. Görlitz, 1927.

It is suggested that the organism causing a fever that was prevalent during the summer of 1926 in certain marshy districts of Silesia may be transmitted by a biting Arthropod. The onset of the illness is sudden, with high fever, and it lasts, on an average, 5 days, the patient feeling extremely ill. Adults who work out of doors in marshy districts are most subject to attack.

Milbenkrankheit. [Disease caused by Mites.]—*Abh. naturf. Ges. Görlitz*, xxx, no. 1, p. 132. Görlitz, 1927.

Numerous cases of infestation in man by larvae of the mite *Trombidium* (*Sericothrombium*) *holosericeum*, L., were recorded in the summer of 1926 in the neighbourhood of Görlitz. The larvae bore in the skin, producing intense irritation.

Newman (L. J.). **Report of Economic Entomologist.**—*W. Australia Dept. Agric. Ann. Repts. 1924–25 & 1925–26*, pp. 22–24 & 29–31. Perth, W.A., 1925 & 1926. [Recd. May 1927.]

Much of the information contained in these reports has been already noticed [*R.A.E.*, B, x, 235; xiii, 54, 102; xv, 11]. Although the blow-fly parasite, *Mormoniella vitripennis*, Wlk. (*Nasonia brevicornis*, Ashm.), was widely distributed, it apparently makes no difference to the numbers of the pest, and endeavours are being made to secure the European parasite, *Alysia manducator*, Panz., to control it. *Liponyssus* (*Leiognathus*) *bacoti*, Hirst, a mite that breeds on rats and attacks man, has been reported in buildings. The stickfast flea, *Echidnophaga gallinacea*, Westw., is being brought under control by sanitation. The area infested by the buffalo-fly, *Lyperosia exigua*, de Meij., which again caused trouble in the north-west, has apparently been extended.

Goyanes (J.). **Influencia de los Parasitos animales en la Genesis del Cancer.**—*Confer. y Reseñ. R. Soc. esp. Hist. nat.*, i, no. 4, pp. 197–223, 12 figs. Madrid, 31st December 1926.

An account is given of some of the work that has been done on the possible relation to cancer of various animal parasites including the Nematodes that infest rats and have as insect hosts cockroaches and *Tenebrio molitor*; *Cnemidocoptes mutans*, which causes typical lesions in the feet of fowls; *Psoroptes cuniculi*, producing lesions in the ear of the rabbit; and larvae of *Oestrus* (*Gastrophilus*) spp., which penetrate the gastric mucosa of the horse, forming lesions that may degenerate into carcinoma.

Balfour (A.). **Some Tropical Lacunae.**—*Jl. Trop. Med. & Hyg.*, xxx, no. 8, pp. 97–106, 81 refs. London, 16th April 1927.

The object of this paper is to point out some of the problems relating to tropical medicine and hygiene that remain unsolved. The work that has already been done is reviewed, and various suggestions are made indicating lines for future research.

Dyar (H. G.) & Shannon (R. C.). **The North American Two-winged Flies of the Family Simuliidae.**—*Proc. U.S. Nat. Mus.*, lxix, art. 10, no. 2636, 54 pp., 7 pls. Washington, D.C., 1927.

In view of the great increase in the collection of Simuliids in the United States since the publication of the last treatment of the subject in 1914 [*R.A.E.*, B, ii, 167], the authors have undertaken this revision of the Simuliid fauna of the mainland of North America and Greenland. They criticise the classification of Enderlein [*R.A.E.*, B, ix, 104; xi, 138], who recognised 17 genera, as unsuited to American fauna; and themselves recognise four genera, *Parasimulium*, Malloch, including only one species, *P. furcatum*, Malloch; *Prosimulium*, Roubaud, type *Simulium hirtipes*, Fries; *Eusimulium*, Roubaud, type *S. aureum*, Fries; and *Simulium*, Latreille, type *reptans*, L. Keys are given to the species of the last three genera; there are two in the case of *Eusimulium*, based on the female hypopygia and on external characters respectively, and three in the case of *Simulium*, based on the male and female hypopygia and on the external characters of the females.

The following are described as new, all being from the United States unless otherwise stated :—*Prosimulium onychodactylum, P. novum* (also from British Columbia), *P. magnum, P. dicum* (also from Alaska and British Columbia), *P. dicentum, P. exigens, P. pancerastes* (also from Alaska and Canada), *Eusimulium obtusum, E. callidum* (from Mexico only), *E. mutatum*, Malloch, race *permutatum* (also from Alaska and British Columbia), *E. frisoni, E. congareenarum, E. dacotense, E. minus* (also from Alaska), *E. clarum, E. canonicolum, E. pugetense, E. alticolum* (from Mexico only), *Simulium hydationis, S. decorum*, Wlk., subsp. *katmai* (from Alaska and Yukon Territory only), *S. slossonae, S. venator, S. piperi, S. sayi, S. perissum, S. vandalicum*, and *S. jacumbae.*

Brassler (K.). **Kriebelmückenplage in Bulgarien.** [The Simuliid Pest in Bulgaria.]—*Zeitschr. angew. Ent.*, xii, no. 3, pp. 490–493, 12 refs. Berlin, April 1927.

This paper gives information obtained by various workers on the outbreak of Simuliids in Bulgaria in 1923, a preliminary report on which has already been noticed [*R.A.E.*, B, xiii, 57]. Over 3,000 domestic animals were killed by the Simuliids breeding in the mountain streams on which the infested villages were situated. A list of the Simuliids of Bulgaria is given, with tabulated records of the districts where they occur.

Theiler (Sir A.) and others. **Lamsiekte (Parabotulism) in Cattle in South Africa.**—*11th & 12th Repts. Dir. Vet. Educ. & Res., Union S. Africa*, pt. 2, pp. 821–1361, 19 figs., 1 diagr., 13 charts. Pretoria, January 1927. [Recd. April 1927.]

Lamsiekte is a serious disease of cattle in South Africa, now known to be caused by a toxin produced by an anaerobic saprophyte, provisionally named *Clostridium parabotulinum bovis*, that develops in carcases and is ingested by cattle impelled by osteophagia (induced by phosphorus deficiency in the soil and consequently in the vegetation) to eat the débris of carcases. The blowflies, *Chrysomyia* (*Pycnosoma*) *marginalis*, Wied., *C.* (*P.*) *chloropyga*, Wied., and *C.* (*P.*) *albiceps*, Wied., are important agents in infecting non-toxic carcases by conveying the saprophyte from neighbouring toxic ones.

In much of the experimental work cattle were infected with lamsiekte by drenching with larvae or pupae of *Chrysomyia* from toxic carcases, but it cannot be concluded that cattle would naturally acquire the disease by picking up larvae and pupae from around carcases, as observations show that they do not eat them at all. Larvae and pupae of *Chrysomyia* taken from the carcases of animals that had died of lamsiekte generally proved highly toxic, although certain exceptions were noted, while those taken from carcases of animals that had died from other causes were sometimes toxic and sometimes not, but no constant relation existed between the cause of death of an animal and the toxicity of the larvae or pupae taken from its carcase. Larvae were more toxic than pupae, the minimum toxic quantity being $\frac{1}{2}$ oz., and in only two experiments in 17 did larvae fail to produce the disease, while of 18 experiments with pupae on 14 cattle 7 were negative ; it therefore appears that the pupae lose the toxin (by digesting it) in the process of maturing ; empty and dry puparia of *Chrysomyia* did not prove toxic.

Negative results were obtained in three experiments with pupae of the house-fly [*Musca domestica*, L.] from carcases, two of which were toxic, given in quantities of from 3 to 8 oz., and in one experiment with young larvae from the carcase of a slaughtered healthy animal that was subsequently shown to be toxic. These results may be explained by the fact that *M. domestica* breeds in the rumenal contents of carcases, rather than on the putrefying flesh.

In South Africa the life-cycle of *Chrysomyia* from egg to adult occupies from 10 to 28 days. The eggs are laid in masses, stuck together with a salivary fluid, on carcases and occasionally on faecal matter, in shady places; they hatch within 24 hours, and the larvae mature in 4–12 days, pupating either in the soil or underneath a carcase; the pupal stage lasts from 5 to 15 days. Although all flies kept in captivity laid eggs, it is believed that they are sometimes larviparous, as on several occasions young larvae but no egg-shells have been found on fresh carcases within an hour or so of the death of the animals.

Nöller (W.). **Der Nachweis des Ueberträgers des gemeinen Rindertrypanosomas, *Trypanosoma theileri*, mit Hilfe des Kulturverfahrens.** [The Demonstration of the Carrier of the Common Cattle Trypanosome, *T. theileri*, by Means of Cultures.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Ref., lxxix, pp. 133–142. Jena, 1925.

In continuation of his work in 1916 showing that flagellates found in Tabanids are developmental forms of *Trypanosoma theileri* occurring in cattle in Germany [*R.A.E.*, B, v, 11], the author has succeeded in reproducing the infection in cattle from cultures of flagellates from these flies. Near Berlin only 5 per cent. of *Haematopota pluvialis*, L., are infected, and only four specimens proved suitable, of which three produced strains. Cultural forms of these corresponded with those obtained in 1916 from *Tabanus glaucopis*, Mg., and with cultural forms of trypanosomes from cattle blood. Young calves, which are free from infection, were inoculated with the cultures from *H. pluvialis*, and positive results were obtained.

Freeborn (S. B.), Hart (G. H.) & Howell (C. E.). **Confirmatory Evidence that *Habronema* Larvae are not the Etiological Factor in Bursattee.**—*Jl. Amer. Vet. Med. Assoc.*, lxxi, no. 1, pp. 52–57, 8 refs. Detroit, Mich., April 1927.

There is a generally accepted belief that bursattee or granular dermatitis in horses is caused by the presence of larvae of the genus *Habronema*. The adults of this Nematode are normally parasitic in the stomach of horses, the hosts of the larvae being the larvae of flies [*R.A.E.*, B, i, 223, etc.]. At a stud in California bursattee occurs every summer; in no year have all the horses been affected, although certain individual horses have shown typical lesions during successive summers. No effort was made to segregate affected horses, which were groomed with the same implements as those that remained unaffected; moreover, some of the unaffected animals received cutaneous injuries, which healed in a normal period. Dissections were made of flies taken from around the sores of infected horses, collected from the neighbourhood of the laboratory, or bred from manure from infected corrals,

and the stomachs of infected animals were examined, but no *Habronema* larvae were discovered. These negative results indicate that either there are two types of bursattee, a parasitic and non-parasitic type, the aetiologies of which are entirely different, or the reported invasion of bursattee lesions by the larvae of *Habronema* is accidental and of no aetiological significance.

MUSHTAQ AHMAD (C.). **Asafetida in the Treatment of Wounds.**— *Vet. Rec.*, vi, no. 19–21, pp. 432–436, 10 refs. London, 22nd May 1926.

In the course of experiments with preparations of asafetida (a product of the root of *Ferula foetida*) as a wound dressing for animals in the Punjab, the author has found that in addition to being an excellent antiseptic it is repellent to flies. Formulae for alcoholic, aqueous and glycerinated solutions and an ointment are given.

BRITTLEBANK (J. W.). **Mastitis.**— *Vet. Rec.*, vi, no. 50, p. 1095. London, 11th December 1926.

The author is of the opinion that flies are the principal factor in the causation of a type of mastitis in cows that is often prevalent in Britain during July and August, especially when the weather is hot, with frequent rainy intervals. In view of the way in which flies congregate, after milking, around the orifice of the teat, the end of each teat should be anointed with some adhesive disinfectant, such as carbolised vaseline or carbolised zinc ointment, 1–15. Where this has been properly carried out, the occurrence of the condition has been completely prevented. In the case of dry cows lying out, it is sufficient to dress the teats once a week.

MCATEE (W. L.). **Notes on Insect Inhabitants of Bird Houses.**

MALLOCH (J. R.). **Descriptions of a new Genus and three new Species of Diptera.**—*Proc. Ent. Soc. Wash.*, xxix, no. 4, pp. 87–93. Washington, D.C., 18th May 1927.

Lists are given of the insects found in the nests of birds taken from nesting boxes in Maryland, and the following Diptera are described by Malloch: The Tachinids, *Neossos marylandica*, gen. et sp. n., reared from the nest of the purple martin (*Progne subis*), and *Plectops pruinosa*, sp. n., from the nest of the bluebird (*Sialia sialis*); and the Anthomyiid, *Fannia nidicola*, sp. n., from the nest of the crested flycatcher (*Myiarchus crinitus*). The puparia of *N. marylandica* and *F. nidicola* are also described.

ROUBAUD (E.) & COLAS-BELCOUR (J.). **Recherches biologiques sur les Phlébotomes de la Tunisie du Nord.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 1, pp. 59–80, 16 refs. Tunis, April 1927.

As the result of investigations in Northern Tunis, where four species of *Phlebotomus*, *P. papatasii*, Scop., *P. perniciosus*, Newst., *P. sergenti*, Parrot, and *P. minutus africanus*, Newst., were found frequenting dwellings, it appears that domestic animals play a much smaller part

than man in providing these sandflies with blood. While the first three attack man in preference to animals, the last attacks almost exclusively the small, cold-blooded animals. The relative frequency of the two principal species between the beginning of July and the end of September varied according to the season, *P. papatasii* predominating in July-August and *P. perniciosus* being most numerous in August-September, while the proportion for the whole period was 37·8 per cent. for *P. papatasii*, 45·4 per cent. for *P. perniciosus* and 16·6 per cent. for *P. sergenti*. The last named, which has long been common in Southern Tunis, was found, for the first time, in considerable numbers in the North.

Although it does not appear that sandflies can be effectively diverted to animals under the conditions prevailing in Northern Tunis, the attack of the various species on dogs merits special study in this connection. It is possible that these animals, particularly the young ones, are freely attacked by *Phlebotomus*, but probably only when they sleep in dark corners of heavily infested houses, and close to inhabited rooms. If it is eventually proved that canine leishmaniasis is actually carried by *Phlebotomus*, the sporadic character and rarity of this disease in Northern Africa, even where the sandflies are abundant, will perhaps be explained by the distance at which the dogs are kept from man in Arab habitations. All three of the species under observation though readily attacking dogs, guineapigs, and rabbits, invariably attacked the arm of man in preference to one of these animals when both were introduced into the cage.

For the purpose of making experiments on the transmission of canine leishmaniasis, experimental breeding of *Phlebotomus* was carried on, and the life-cycles of *P. papatasii* and *P. perniciosus* were determined. It was discovered that the survival of the female after ovipositing depended on the maintenance of strict thermal conditions and the administration of a blood meal as soon as possible after oviposition. The best results in obtaining regular oviposition under confined conditions were secured by the employment of a block of plaster about 3 in. thick poured directly into a crystalliser 7 in. in diameter in which several circular breeding cells were hollowed. Each cell was covered with an inverted glass funnel, the tube of which was plugged and the rim luted to the surface of the plaster to prevent the escape of the ovipositing female isolated under it. The daily introduction of water into a hole, 1 in. in diameter, situated in the centre of the block served to maintain constant humidity. While the initial isolation of the species can best be effected by means of individual cells hollowed out of small blocks of plaster and placed in the crystalliser on a bed of moist sandstone, these multiple cells are useful for raising in groups all the broods belonging to the various individuals of one species and ensure absolute uniformity of humidity. The authors' endeavours to obtain oviposition of *Phlebotomus* in muslin cages in the normal air of the laboratory in direct contact with permanently moist oviposition media, a method used by Young, Richmond & Brendish [*R.A.E.*, B, xiv, 147], have never succeeded. Of the many foods tried the best and simplest consisted of 5 parts sifted garden soil mixed with 1 part dried horse's blood. A thin and uniform layer of this medium should be sifted into the breeding cells every two or three days. A slight formation of mould will not harm the larvae. Adults bred in the cells can live there for some days on a little glucose. They are subsequently placed in muslin cages for a blood meal and replaced in the breeding cells.

Observations of the life-history of *P. papatasii* correspond with those previously established [*R.A.E.*, B, i, 27 ; xi, 61], the length of time taken for the completion of the life-cycle of this species varying according to the temperature. Hibernation takes place in the fourth larval instar, and the authors found that a period of suspended development, lasting for several months, occurred in this instar in a proportion of the larvae even at a constant temperature of 27° C. [80·6° F.]. They consider that this check in development can be independent of humidity or temperature, and that *P. papatasii* may be regarded as heterodynamic [*R.A.E.*, B, xi, 55 ; xv, 85]. It differs, however, from heterodynamic Muscids in that the diapause occurs irregularly in certain individuals, apparently in each generation, instead of cyclically in all the individuals of one generation [*cf. R.A.E.*, A, xv, 105]. This irregular and prolonged suspension of development would tend to render infestation by *Phlebotomus* to a certain extent continuous.

Females of *P. perniciosus* placed in a moist cell after a blood meal oviposit about 10 days after feeding, though in some cases oviposition takes place 4 or 5 days after the meal, the eggs being deposited around the extreme edge of the cell. As many as 71 eggs may be laid by one individual under artificial conditions, and in nature the female deposits at least 60 eggs at the first oviposition. At 28° C. [82·4° F.] the eggs hatch in 6–7 days, the larval stage lasts 13–19 days, pupation taking place 5–7 days after the third moult, and the pupal stage lasts 8 days, the total period from egg-laying to the emergence of the adult averaging about 30 days. At a slightly lower temperature of 25–26° C. [77–78·8° F.] the process takes more than 50 days, the egg stage occupying about 12 days, larval 30–36, and pupal 10–11 ; at 27° C. the minimum was 46 days. The life-cycle is thus slightly shorter than that of *P. papatasii*, the minimum development periods of which, under similar conditions, were 48 days at 27° C. and 57 days at 25–26° C. Although no clear evidence of the occurrence of a diapause was found in *P. perniciosus*, certain individuals developed much more slowly than others under identical conditions, eggs laid in one day by one female producing adults in two batches, the first in 54–70 days and the second in 106–140 days.

While females of *P. papatasii* generally feed 24 hours after reaching the adult stage, those of *P. perniciosus* take the first blood meal only after an interval of 3 or 4 days. It is possible for a female in captivity to live from 2 to 5 weeks without blood, being fed solely on glucose and water, though females of *P. papatasii* will bite several times in succession at intervals of 24 hours, and a female of *P. perniciosus* bit again after a full meal taken 2 days previously.

ROUBAUD (E.) & WEISS (A.). **Note sur un Hémiptère Réduvide chasseur de Moustiques et de Phlébotomes dans la Tunisie du Nord.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 1, pp. 81–83, 1 fig. Tunis, April 1927.

The Reduviid bug, *Ploiaria domestica*, Scop., which is common in south Europe and north Africa, has been frequently found in native dwellings in the neighbourhood of Tunis, where it feeds on flies, mosquitos, *Phlebotomus* and possibly bed-bugs [*Cimex*], showing a preference for engorged females. The newly fed adult bugs can live as long as two months without food. The life-history is not fully known. Descriptions of the egg and the young larva are given.

Weiss (A.). **Notes sur les captures de Phlébotomes effectuées dans la banlieue de Tunis de juillet à fin octobre 1926.**—*Arch. Inst. Pasteur Tunis*, xvi, no. 1, pp. 84–89. Tunis, April 1927.

Tables showing the numbers of *Phlebotomus* caught in the Carthage district on the outskirts of Tunis demonstrated that the maximum abundance of the sandflies occurred in August and September, coinciding with the maximum temperature. The chief factor in certain decreases that occurred in the numbers present during the hot period appeared to be the relative freshness and intensity of the wind, which seems to have more effect in checking breeding than a fall in the temperature. The proportion of males to females in the breeding-places visited, which were mainly the sleeping apartments of natives, was about 20 per cent. They appeared to be most numerous in July, September and the first half of October, probably coinciding with the appearance of fresh broods. The species captured were chiefly *P. perniciosus*, Newst., and *P. papatasii*, Scop.

Blanchard (M.), Broudin (L.) & Borel (E.). **Surra du chien. Traitement par Bayer 205. Guérison(?). Expériences négatives de transmission de l'affection par** *Rhipicephalus sanguineus*, **Latr.**—*Bull. Soc. Path. exot.*, xx, no. 3, pp. 222–225, 4 refs. Paris, 1927.

A case is recorded of a dog in Indo-China, infected with *Trypanosoma annamense* and heavily infested with *Rhipicephalus sanguineus*, Latr. All cattle in Cochin China harbour *Boophilus annulatus*, Say, which lives from the larval to the adult stage on its host and only leaves it to die in the case of males or to oviposit in the case of females. Many dogs are infested with *R. sanguineus*, which also attacks poultry, cattle, and man, but is only attached to the host for feeding and leaves it as soon as engorgement is complete. Experiments showed, however, that *T. annamense* is rapidly destroyed in the digestive tract of *B. annulatus* and *R. sanguineus*, so that transmission by this means is impossible. This is borne out by the striking contrast between the abundance of the latter tick and the rarity of natural infection of the dog by this trypanosome.

A study of the district and Dipterous fauna of the locality confirm the view that while forest Tabanids are the primary vectors of trypanosomes from some unknown wild animal, the disease is subsequently spread by *Stomoxys* [*cf. R.A.E.*, B, xv, 29].

Lépine (P.). **Contribution clinique et expérimentale à l'étude de la fièvre de trois jours en Syrie.**—*Bull. Soc. Path. exot.*, xx, no. 3, pp. 251–260, 10 refs. Paris, 1927.

The author does not agree with the generally accepted theory of the immunity conferred by an attack of sandfly (three-days') fever, and declares that it is quite usual in Syria to find persons who have contracted the fever twice in successive seasons. He considers that the relative immunity of the natives is due to the repeated inoculations to which they have been subjected since their childhood. The fever, which is frequently confused with dengue (transmitted by mosquitos), and with fevers resembling dengue, is epidemic and is limited to definite seasons, which coincide with the occurrence of *Phlebotomus*. In experiments with animals, guineapigs have been subjected four times

and a rabbit once to the bites of *Phlebotomus* caught in the mosquito-nets of patients suffering from the disease, without result. The transmission of sandfly fever to animals has never been definitely proved; and in experiments laboratory animals did not seem to be susceptible to the disease by inoculation. In an experimental infection of man, the incubation of the disease lasted 3 days 8 hours, the average incubation period observed by other investigators being from 4 to 5 days.

[Adova [A. N.], Nikitinskiĭ [V.] & Sebentzov [B. M.].] Adova, Nikitinsky & Sebenzow. **Biologie et constitution physico-chimique des tourbières et conditions qui y règlent le stationnement des larves d'***Anopheles*.—*Bull. Soc. Path. exot.*, xx, nos. 2 & 3, pp. 192–196 & 271–279, 5 refs. Paris, 1927.

This is a detailed account of the flora and fauna occurring in sphagnum-peat and sedge-peat bogs in European Russia. The information concerning Anophelines is substantially the same as that already noticed from another source [*R.A.E.*, B, xiv, 201].

Sant'Ana Barreto (J.). **Index endémique du paludisme en Guinée portugaise.**—*Bull. Soc. Path. exot.*, xx, no. 3, pp. 280–285. Paris, 1927.

An investigation into the occurrence of sleeping sickness among natives in regions of Portuguese Guinea infested by *Glossina palpalis*, R.-D., resulted in the finding of one indigenous case of the disease out of 236 natives examined. Incidentally, the search for trypanosomes afforded an opportunity to determine the local malarial index. The rains begin in June, and the epidemic period of malaria covers the months of July–November. Of the 236 natives examined, 32 per cent. were infected with malarial parasites, of which *Plasmodium praecox* generally predominated, though in one locality, where *Anopheles squamosus*, Theo., occurred, *P. vivax* was found with remarkable frequency, while in the rest of the colony *A. gambiae*, Giles (*costalis*, Theo.) and *A. mauritianus*, Grp., were the only Anophelines observed.

Cazanove (F.). **Considérations sur les cas de fièvre jaune observés au Sénégal en 1912.**—*Bull. Soc. Path. exot.*, xx, nos. 2 & 3, pp. 197–204 & 286–295. Paris, 1927.

The importance of tracing cases of yellow fever from their initial stages, in order to prevent confusion with malaria and other fevers, is pointed out. The changes observable in the organs of patients suffering from yellow fever and from blackwater fever are enumerated for purposes of comparison. While epidemics of yellow fever have usually been recorded at the height of the hot season, cases have recently been recorded in Senegal at the end of the hot season and the beginning of the cold, that is, at the season that is generally associated with the appearance of severe malaria and serious blackwater fever. It is suggested that perhaps attenuated cases of yellow fever occur during the hot weather, the patient harbouring the disease and passing it on to others. Noguchi has recorded a somewhat similar process with regard to guineapigs infected experimentally. The author records four cases of a fever

appearing in the hot season, which was not dengue or relapsing fever, but caused inflammation of the biliary tract. They exhibited symptoms resembling those of five-days' fever, which is now considered to be associated with primary attacks of malaria, but in the cases in question quinine had no effect on the temperature, and it is suggested that they may have been cases of attenuated yellow fever.

Knowledge of *Aëdes* (*Stegomyia*) [*argenteus*, Poir.] under Senegal conditions is very incomplete. The mosquitos are always in evidence about railways at the end of the hot season, and it may be that they attain their maximum abundance at that period. According to Noguchi, the amount of blood ingested by the female of *A. argenteus* is less than 0·01 cc., so that the bites of several mosquitos are often necessary for the inoculation of yellow fever. This difficulty in the transmission of yellow fever may perhaps explain the endemic cases observed in recent years in widely distant localities. The author suggests that visits to restaurants, stores, etc., where many natives are employed, and where receptacles may be lying about suitable for the breeding of mosquitos, while many dark corners afford shelter to the adults, may be a prolific source of infection.

Couvy (L.). **A propos de la fièvre jaune.**—*Bull. Soc. Path. exot.*, xx, no. 3, pp. 295–299. Paris, 1927.

As a comment on the preceding paper, in which cases of yellow fever are recorded in the winter season, in contrast to the usual incidence during the hot weather, the author points out that climatic conditions in 1926 were particularly favourable for the occurrence of yellow fever. *Aëdes* (*Stegomyia*) [*argenteus*, Poir.], which generally disappears almost entirely with the cold weather, was able to survive in numbers and continue its activities throughout the winter. This abundance of the mosquito resulted, at Dakar, in an epidemic of dengue that attacked practically the whole of the European population. According to old inhabitants of that town, epidemics of dengue there have generally been followed by epidemics of yellow fever, and the epidemiological conditions of these two spirochaetal infections are so similar that their association is not surprising. *A. argenteus* is essentially a domestic mosquito, and a systematic and thorough search from house to house is the only method of dealing with it. This can only be accomplished by a sufficiently numerous and instructed staff, an organisation for which is suggested.

Boëz (L.). **Travaux récents sur l'étiologie de la fièvre jaune.**—*Rev. d' Hygiène*, xlviii, no. 1, pp. 1–23, 33 refs. Paris, January 1926.

This paper forms a review of present knowledge regarding yellow fever, and deals chiefly with the work of Noguchi [*R.A.E.*, B, viii, 78; xiii, 121].

Vogel (R.). **Eine für Württemberg neue Stechmücke: *Culex apicalis* Adams (*Culex sergenti* Theobald, *C. territans* Howard, Dyar u. Knab).** [A Mosquito new to Württemberg: *C. apicalis*.]—*Jahresh. Ver. vaterl. naturk. Württemberg*, lxxxii, pp. 113–115, 1 fig., 6 refs. Stuttgart, 1926.

The larva of *Culex apicalis*, Adams, is recorded from a brook near Stuttgart, in company with those of *Anopheles maculipennis*, Mg., and *A. bifurcatus*, L.

Les Moustiques.—*Bull. Soc. Etudes océan.*, no. 14, pp. 91–94, 4 figs. Papeete (Tahiti), August 1926. [Recd. May 1927.]

No Anopheline mosquitos have yet been recorded from Tahiti, but the differences between them and Culicines are pointed out and the various stages of their development figured, with a view to their recognition and the prevention of their introduction.

Marchoux (E.). **Le Paludisme dans les Dombes et en Camargue.**—*Bull. Acad. Méd.*, 1927, p. 67. Paris, 11th January 1927. (Abstract in *Bull. Inst. Pasteur*, xxv, no. 7, p. 330. Paris, 15th April 1927.)

A malaria epidemic has not been experienced in the Dombes region (a hilly plateau with many ponds) since the law of 1863 prescribed the systematic draining of ponds. Since 1901, however, conditions have changed, and it is estimated that over 27,000 acres of ponds exist in the region. Although Anophelines, particularly *Anopheles maculipennis*, Mg., are abundant, malaria is practically unknown. The improvement in conditions of living generally, and particularly the development of cattle breeding and stabling are considered to be the cause of this, the mosquitos there attacking animals in preference to man.

In Camargue conditions are quite different, and the agricultural labourers on the large estates live in extreme poverty and are frequently attacked by malaria. The number of cases is not, however, merely due to the number of Anophelines, which are abundant, but since the cattle are not so numerous as in the Dombes region, animal protection is not so great. The breeding of farm animals should therefore be increased and the drainage of the land completed.

Franchini (G.). **E il maiale ricettivo all'infezione malarica ?** [Is the Pig receptive to malarial Infection ?]—*Arch. ital. Sci. med. colon.*, viii, no. 1, pp. 7–11. Tripoli, January 1927.

In view of the fact that pigs are attractive to Anophelines, examinations of their blood were made in various provinces in Italy. In the areas concerned *Plasmodium vivax* is the causal agent of malaria, except in one locality where *P. praecox* is responsible. No malarial parasites were found in the pigs, nor was any infection produced in pigs by injection of *P. vivax* and *P. praecox* nor by exposure to the bites of infected *Anopheles maculipennis* (*claviger*).

Rybinski (S. B.). **The Analysis of the Malaria Curve in Kiev.**—*Centralbl. Bakt. Paras. Infekt.*, Ite. Abt. Orig., c, no. 7–8, pp. 316–320, 7 refs. Jena, 1926.

Accurate rceords of malaria (exclusively benign tertian) in an area near Kiev show that the curve of primary cases and the curve of the total number of cases are similar and have two rises, at the end of spring and at the end of summer. Two Anophelines occur in the district, *Anopheles maculipennis*, which is of epidemiological importance, and *A. bifurcatus*, which is rare. Hibernation of the former continues to the end of March or beginning of April. The first larvae occur early in May, and the first flight occurs early in June. There are five generations from spring to autumn, the mosquitos having returned

to their hibernation quarters by mid-October. The primary cases in the spring rise must be ascribed to autumn infection. The fall in summer may be explained by the small number of infected mosquitos in nature and the absence of factors causing the spring activity of malaria. The increase of infected mosquitos causes the rise in autumn, and also the infection of those cases in which the disease is not evident until the following spring. Primary cases due to mosquitos of the same year first appear about a month after the flight of the first brood.

MARTINI (E.). **Ueber Mückenplage und Malaria.**—*Med. Klinik*, 1927, no. 12, reprint, 4 pp. Berlin, 1927.

Heavy rains in Germany in June and July 1926 resulted in floods with a consequent increase of mosquitos. A few cases of malaria occurred, and if meteorological conditions are favourable to mosquitos in 1927, the disease may definitely increase. The destruction of adult mosquitos in cellars in winter is of very limited value, as those found indoors are chiefly *Culex pipiens*, with a small number of *Theobaldia annulata* and only a very few *Anopheles maculipennis*. *Aëdes* spp., which are troublesome in the open from May to July, do not occur indoors. The destruction of the larvae in summer requires expert supervision to determine the species concerned and to find their breeding-places.

DIVE (G. H.). **Dengue in Aden: A Clinical and Statistical Survey, with an Appendix on Fevers in Aden.**—*Jl. R.A.M.C.*, xlviii, no. 4, pp. 241–247. London, April 1927.

Dengue is endemic in Aden, and is epidemic from April to July among troops arriving in the winter, while a further epidemic occurs in September in some years among troops that have not been exposed to the disease earlier in the year or in the preceding year, a high degree of immunity resulting from an attack. The seasonal incidence of the disease corresponds with the seasonal abundance of the vector, *Aëdes argenteus*, Poir., during the period of greatest heat and moisture, from April to September; in July and August the physical conditions are slightly better, and there is a reduction in the incidence of both *A. argenteus* and dengue. Various diseases, such as sandfly fever, have been confused with dengue, and the author considers it very doubtful whether sandfly fever exists in Aden; he has been unable to obtain definite evidence of the occurrence of *Phlebotomus* there. Malaria is absent from Aden proper, except for imported cases, but the introduction of Anophelines from the immediate hinterland, where they are abundant and the incidence of the disease among Indian troops is very high, is always possible, and in view of the large numbers of malaria carriers commonly present at the station, this would have serious consequences.

KOIDZUMI (M.). **On the Spread and Prevalence of Malaria in Formosa.** —*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 27–31. Tokyo, 1926. [Recd. 1927.]

The author has previously distinguished and described nine species of Anophelines in Formosa [*R.A.E.*, B, xiii, 185; xiv, 29], and now

adds to the list *Anopheles aitkeni*, James, *A. subpictus*, Grassi (*rossi*, Giles), and a species resembling *A. gigas*, Giles. The commonest is *A. hyrcanus* var. *sinensis*, Wied., both in frequency of occurrence and range of distribution. *A. minimus*, Theo., and *A. maculatus*, Theo., are also common throughout the Island; *A. fuliginosus*, Giles, and *A. tessellatus*, Theo., are widely distributed but less abundant. *A. ludlowi*, Theo. (*hatorii*, Koidz.) is fairly common in the southern regions; *A. indiensis*, Theo. (*splendidus*, Koidz.), is rare; *A. jeyporiensis* var. *candidiensis*, Koidz., and *A. lindesayi* var. *japonicus*, Yam. (*pleccau*, Koidz.) are probably limited to the central mountain regions.

Adults of these nine species, except *A. jeyporiensis* var. *candidiensis*, were fed on persons suffering from malaria; all were found to convey benign tertian, and oocysts of malignant tertian developed in all except *A. hyrcanus* var. *sinensis*. The disease seems to be transmitted most readily by *A. tessellatus*, but *A. maculatus* is probably the most important carrier, being so much more numerous. There are generally two epidemics of malignant tertian malaria in the year, the summer one beginning in May, June or July and reaching its height in August or September, and the winter one beginning in September or October and reaching its height in November or December. In the south two epidemics occur every year, the summer one beginning early, while in the centre there may be only one.

Necheles (H.). **The Influence of Humidity on the Habits of** *Anopheles maculipennis*.—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, p. 53. Tokyo, 1926. [Recd. 1927.]

Studies on heat regulation in insects have shown that humidity in the air is important to normal insect life. At high temperatures the body temperatures of insects are kept low by the evaporation of water, so that an air humidity above or below certain limits creates physiologically unfavourable conditions. The habit of *Anopheles maculipennis*, Mg., of flying only at certain hours of the day and its choice of hibernating places are largely dependent on the humidity and temperature of its environment.

Hoffmann (W. H.). **Yellow Fever as a Far Eastern Problem.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 143–157. Tokyo, 1926. [Recd. 1927.]

The control of yellow fever in America has made immense progress in the last twenty years, and it is hoped that before long the disease will be entirely eradicated. Nevertheless, although there is very little danger of its introduction into the Far East, in view of the excellent quarantine service of the American seaports, its importation there would be such a great catastrophe that the problem should receive careful study. The precautions that should be taken by health officers and the measures that should be instituted, should there be the slightest suspicion of any case occurring in ships entering Eastern ports, are briefly outlined. To prevent infected individuals of *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) from flying to shore, ships would have to be kept at a distance of 1–2 miles, and any suspicious case in man should at once be isolated and protected from mosquito bites. [*cf. R.A.E.*, B, III, 141; x, 103.]

Wu Lien-Teh. **Practical Aspects of Plague in Wild Rodents.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 815–836. Tokyo, 1926. [Recd. 1927.]

As a result of further investigations in connection with the Manchurian Plague Prevention Service [*R.A.E.*, B, xiii, 85], the author has compiled a revised list of all the rodents known to be naturally infected with plague, other than the domestic rat and mouse. This includes several additional South African wild rodents. The modes of transmission of the disease from animal to animal and from animal to man are discussed. The latter can be effected by direct contact through wounds or abrasions, indirectly through the bites of parasites, or through other wild rodents, domestic rodents or other animals acting as intermediate hosts. A short summary of the measures adopted in different parts of the world for controlling plague in wild rodents is given. In the case of the tarbagan (*Arctomys bobac*), which is of economic value, there is no question of attempting to exterminate the animals, and, as a consequence of the removal of the ban against the tarbagan trade, the Plague Service recommends certain regulations which are embodied in an appendix.

Hayashi (N.), Oshima (F.), Eguchi (S.) & Hozumi (K.). **On Tsutsugamushi Disease and its Virus.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 925–930, 3 pls. Tokyo, 1926. [Recd. 1927.]

An account is given of the mite, *Trombicula* (*Microtrombidium*) *akamushi*, Brumpt, the vector of tsutsugamushi disease, and the pathology, aetiology, prevention and treatment of the malady are discussed. Investigations in Japan have shown that the mite attaches itself to the inner surface of the auricles of the field-mouse, *Microtus montebelli*, and to the canthi of *Acrocephalus orientalis*. The adult female lives in the ground. Three species of the same genus of mite have been discovered in the infected districts, as well as *Trombicula* (*Leptus*) *autumnalis*, Shaw, which was not previously known to occur in Japan. Japanese monkeys (*Pithecus fuscatus*) were used for experiment, as they are attacked when introduced into the infected districts and develop the typical lymphatic gland swelling. Other animals, such as rats, guineapigs, birds and rabbits, though not exhibiting the typical symptoms, can be used as virus carriers. Many of the field mice and oriental reed sparrows living in the infected districts show the typical splenic swellings, and inoculations from these into monkeys produce typical fever ; they are therefore considered to be the sources of the virus. The bodies isolated from infected animals approach very nearly to *Rickettsia*, but are not considered to be identical ; cross-inoculation with the virus of Rocky Mountain spotted fever does not influence the disease. It is suggested that as the virulence of the disease is weakened by successive passages through birds, such weakened virus should be taken from birds and inoculated into children, inducing a slight attack, in order that they may acquire immunity ; this method has given satisfactory results in eight cases in which it has been tested. A form of dress is described and illustrated which peasants might wear in the infected districts ; this and the sprinkling of disinfectants on the uncovered parts of the body should almost completely eliminate danger of contracting the disease. The ideal

remedy, however, would be to disinfect the land where the adult female mites live, and it has been found that their number can be materially lessened by applications of lime.

ISHIWARA (K.) & OGATA (N.). **Ueber den Erreger der Tsutsugamushi-Krankheit.** [On the Causal Agent of Tsutsugamushi Disease.] —*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 931–935, 1 ref. Tokyo, 1926. [Recd. 1927.]

A preliminary account of these observations on a micro-organism that appears to be the causal agent of tsutsugamushi or Kedani fever has already been noticed [*R.A.E.*, B, xi, 99]. The organisms have been found in infected animals, especially in the lymphatic glands and spleen and at the site of the puncture made by the mite [*Trombicula akamushi*, Brumpt].

NAGAYO (M.). **On the Virus of Tsutsugamushi Disease.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 937–939. Tokyo, 1926. [Recd. 1927.]

Intradermal inoculations into monkeys of the virus of tsutsugamushi disease are always more effective than subcutaneous ones. The rostrum of the mite, *Trombicula akamushi*, Brumpt, is too short to penetrate the subcutaneous tissue of man or animals. The minute bodies found in the spleen of infected animals are described; similar bodies have recently been demonstrated in the mite. The characters of the virus causing the disease, which are enumerated, and the similarity of the clinical features to those of typhus fever and Rocky Mountain spotted fever suggest that the causal agent of tsutsugamushi may be a so-called *Rickettsia*.

TAKEUCHI (N.). **Experimental Studies on Rocky Mountain Spotted Fever.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 941–944. Tokyo, 1926. [Recd. 1927.]

The symptoms of Rocky Mountain spotted fever in laboratory animals are described. In studying the micro-organisms associated with the disease the author has discovered forms, some of which resemble *Dermacentroxenus rickettsi* [*R.A.E.*, B, xiv, 103], while others may be *Rickettsia* or spirochaetes. An account is given of the symptoms, anatomical pathology and distinguishing characters of Rocky Mountain spotted fever, tsutsugamushi disease and typhus.

HOOPS (A. L.). **Some Aspects of Health Work in the States of Georgia and Alabama, United States of America.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 979–998. Tokyo, 1926. [Recd. 1927.]

This paper includes an account of observations on mosquitos and malaria in a highly malarious district in southern Georgia [*R.A.E.*, B, xii, 180; xiv, 52, 61].

DA COSTA (P.). **Epidémiologie de Macao.**—*Far Eastern Assoc. Trop. Med. Trans. 6th Bien. Cong. Tokyo, 1925*, ii, pp. 1095–1116. Tokyo, 1926. [Recd. 1927.]

Plague, which was first recorded from Macao, China, in 1895, established itself there as an endemic disease until 1915, rising occasionally to epidemic proportions. A study of the rats and mice present and of their parasites, made by Dr. A. Leitão, resulted in the finding of *Mus norvegicus* (*decumanus*), *M. musculus*, an exotic variety of *M. agrarius*, and a variety of *M. rattus*, the last being perhaps a hybrid of this species and *M. norvegicus*. In the epidemic of 1912 it was remarked that the species most infested by fleas was *M. norvegicus* while the least infested was *M. musculus*. Both the latter and *M. rattus* were scarce, and consequently, instead of *M. norvegicus* first contracting the disease and passing it on to *M. rattus*, it was confined to the former. The author, however, recently found the percentages to be about 30 per cent. *M. rattus*, 60 per cent. *M. norvegicus* and 10 per cent. *M. musculus*. *M. norvegicus* generally harbours only one species of flea, *Xenopsylla* (*Pulex*) *cheopis*, Roths., while *M. rattus* and *M. musculus* are also infested by *Leptopsylla* (*Ctenopsylla*) *musculi*, Dug. Epidemics of plague always started at the port. The measures taken to combat them are briefly described.

ASHWORTH (J. H.). **The Distribution of Anopheline Mosquitoes in Scotland.**—*Proc. R. Soc. Edinburgh, 1926–1927*, xlvii, pt. 1, no. 6, pp. 81–93, 1 map, 15 refs. Edinburgh, 1927.

Very little has been written concerning the occurrence of Anophelines in Scotland, and these data constitute merely the beginning of a survey in that country. Details are given of the recorded occurrence of each of the three species known. The evidence is admittedly scanty and uneven, but indicates that *Anopheles bifurcatus*, L., is the most abundant and wide-spread species, *A. plumbeus*, Steph., occurs in a large proportion of the eastern coastal region, while *A. maculipennis*, Meig., is relatively scarce, though search in stables, etc., may show greater abundance than is at present recorded. *A. plumbeus* readily attacks man both indoors and out, and in some houses *A. bifurcatus* has recently been very troublesome. A single case of indigenous malaria has been recorded in Scotland since the disease became notifiable in 1919; in this case, occurring in August 1919, the disease was probably contracted from troops present in the neighbourhood in July.

NICHOLLS (L.). **The Use of Copper Aceto-Arsenite (Paris Green) as an Anopheline Larvicide.**—*Ceylon Jl. Sci.*, Sect. D, Med. Sci., ii, pt. 1, pp. 21–30, 1 pl., 2 figs., 6 refs. Colombo, 16th March 1927.

The discoveries leading to the use of Paris green diluted with inert dust as an Anopheline larvicide are briefly reviewed. Experiments in Ceylon were begun in wet weather when no road dust was available as a diluent, and experiments with coir dust, which accumulates at factories using coconut fibre for manufactures, proved this to be an equally good diluent when sifted through a wire gauze sieve of 30 strands to the inch. Further experiments confirmed the finding of other workers that Paris green is absolutely harmless to plants and fish when used in quantities deadly to Anopheline larvae. As larvicides are

particularly requisite in rice-fields in Ceylon, especial attention was given to this subject. It was found that where the water was stagnant or flowing very slowly, Paris green mixed with 99 times its weight of coir dust proved an excellent larvicide.

The larvae of *Anopheles* are invariably found near the edges of the bunds that divide the fields into sections and retain the irrigation water, and for the purpose of control they can be considered as confined in growing rice to the water within a yard of the bund. When thrown by hand and carried by the wind over the ricefields, the dust was uncertain in its action and the method proved wasteful. The best method of distribution is by means of a knapsack sprayer, the distributing tube of which is held a few inches above the water and guided along the edges of the bunds. In this way one coolie working for 6 hours can treat the edges of 9 acres of rice-fields. In rapidly flowing water, Paris green was far less effective, the reason being that the larvae maintain themselves against the flow of the current along the overgrown edges of the bunds where the movement of water is slowest, while the Paris green mixture is drawn into the current and away from the larvae. In such cases the tube of the sprayer must be held near the water and very close to the edges of the bund. Dust thrown by hand is quite ineffective in flowing water.

The rice-fields in Ceylon are mostly irrigated by streams from large artificial lakes, and it was suggested that if the Paris green mixture was thrown in large quantities into a main channel it would flow to the irrigation channels and thus over large areas of rice-fields. Experiment showed, however, that the mixture streams to the centre of the channel, where the current is fastest, and is carried away from the edges of the channels and the bunds, and finally collects in a small area in the lowest part of the irrigated fields, so that it never reaches those parts where the larvae are present in the greatest numbers. The same applies to all moving water, the dust going to the centre while the larvae are found in the quiet waters near the banks. In the majority of experiments, the effectiveness of the dust decreased gradually from the first day, and even large quantities lost their effectiveness after 3 days. There was generally no larvicidal action after 5 days. It was found that buffaloes wallowing in water that has been dusted, or frogs, fish, etc.. that agitate it, quickly cause Paris green to sink, and even slight wind rippling over the surface would cause sinking within 30 hours. Rain caused the dust sprayed on tubs of water to disappear in a few minutes, and it was, therefore, found almost impossible to destroy larvae during rain.

While the rice-fields contain growing plants or are lying fallow, the water present is almost always clear and the predominating Anophelines are the relatively harmless *Anopheles subpictus*, Grassi (*rossi*, Giles) or *A. hyrcanus*, Pall. When the fields are prepared for sowing, water is run on to them to a few inches in depth, and buffaloes are driven round and round them until the weeds are trampled in and the earth is like soft mud. They may be left like this for about two weeks,and Anopheline larvae abound in the muddy pools that accumulate, the species very often being *A. listoni*, List., or *A. culicifacies*, Giles. When these pools are sprayed with the Paris green mixture, it frequently occurs that the larger larvae only are destroyed, the youngest, perhaps, feeding on food particles that are smaller than those of the larvicide. This necessitates spraying at intervals of 2 or 3 days because the fields are then in their most dangerous condition. During the dry season in the

northern provinces of Ceylon, many ponds shrink into similar muddy pools constantly agitated by cattle and other animals ; these require almost daily spraying as they are important, many mosquitos being able to survive in them that will breed in vast numbers during the wet season. It is known that oil acts as a deterrent to oviposition, but Paris green does not have this effect. This is important, as certain favourite spots can be used as traps, where the larvae can be constantly killed by the larvicide as they hatch from each successive batch of eggs. Oiling, however, is the more successful measure when it is desired to destroy Culicine as well as Anopheline larvae, or when continual showers of rain prevent the use of Paris green.

A machine suitable for mixing Paris green with an inert dust, which prevents inhalation of the dust or contact with the skin of the operator, is illustrated. For the public safety, it is important that the poison should be mixed with the dust at some central station before distribution for local use.

Nicholls (L.). **The Organisation of Minor Anti-Anopheline Field Work.**—*Ceylon Jl. Sci.*, Sect. D, Med. Sci., ii, pt. 1, pp. 31–36, 1 map. Colombo, 16th March 1927.

Minor anti-Anopheline field work, which is relatively inexpensive and can be undertaken by well-trained sanitary inspectors, comprises small drainage schemes, the filling of hollows, maintenance of drains, clearing of jungle, the spreading of oil, Paris green or other larvicides, and the distribution of larvivorous fish from established nurseries. With thorough organisation, malaria can be effectively controlled by such operations. The personnel required to carry out these schemes, under the supervision of a medical officer or entomologist, is explained, and a method of map preparation, by means of which the smallest collections of water can be reported, is described. One town has been mapped out according to this plan, and the anti-mosquito campaign there is working satisfactorily ; the method of reporting all work done is explained. Probably many minor areas so reported might be crossed off the books after a short time, while the filling and draining of hollows will gradually diminish the area to be worked and consequently the number of workers required.

Christophers (S. R.), Sinton (J. A.) & Covell (G.). **Synoptic Table for the Identification of the Anopheline Mosquitoes of India.**—*Govt. India Central Pubn. Br.*, Health Bull. 10 (Malaria Bur. 2), 22 pp., 5 pls. Calcutta, 1927.

This is a key to the species and varieties of Anophelines occurring in India, with explanations of the terms used.

Covell (G.). **Anti-mosquito Measures.**—*Govt. India Central Pubn. Br.*, Health Bull. 11 (Malaria Bur. 3), [iv]+24 pp., 30 refs. Calcutta, 1927.

A summary is given of the chief methods of mosquito control for the use of those workers in India who have not access to the literature. Almost all the material has been derived from papers by other authors, the greater number of which have already been noticed.

SUNDER LAL HORA. **The Use of Fishes for the Control of Mosquitoes.**—*Ind. Med. Gaz.*, lxii, no. 4, pp. 187–188. Calcutta, April 1927.

Investigations made in response to enquiries show that the Department of Fishery, Madras, is the only organisation that can supply larvicidal fish at present. *Aplocheilus melanostigma*, *Panchax parvus* and *P. striatus* are generally kept in stock. The utility of these species for destroying mosquito larvae has been proved, and they have been used extensively for anti-malarial work.

Inspection of tanks containing large carp, such as *Catla catla*, *Labeo rohita* and *Cirrhina mrigala* as well as small fish of the typical larvicidal genera such as *Aplocheilus*, *Ambassis*, *Chela* and *Barbus* (*Puntius*) failed to reveal a single mosquito larva. Mosquitos breeding in one tank were effectively eradicated by the introduction of individuals of *Panchax* (*Haplochilus*) *panchax*.

Tanks into which it is proposed to introduce larvicidal fish should be cleared of weeds and overhanging vegetation, and if possible drained so that the bottom may be cleaned. All predacious fish should be removed, particular care being taken to clear the tanks of murrel [*Ophiocephalus striatus*] which burrows in the mud and may have to be dug out.

DE BUCK (A.), SWELLENGREBEL (N. H.) & SCHOUTE (E.). **Studies on Anophelism without Malaria in the Vicinity of Amsterdam.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 351–371, 1 map, 13 refs. London, June 1927.

DE BUCK (A.), SCHOUTE (E.) & SWELLENGREBEL (N. H.). **Recherches sur l'anophélisme sans paludisme aux environs d'Amsterdam.**—*Riv. Malariologia*, vi, no. 1, pp. 8–39, 1 map, 12 refs. Rome, January-February 1927.

SWELLENGREBEL (N. H.), DE BUCK (A.) & SCHOUTE (E.). **On Anophelism without Malaria round Amsterdam.**—*Proc. Kon. Akad. Wetensch. Amsterdam*, xxx, no. 1, pp. 61–68, 1 map, 11 refs. Amsterdam, 1927.

These papers contain a further account of an investigation that has already been noticed [*R.A.E.*, B, xv, 21] into the possibility of different biological races of *Anopheles maculipennis*, Mg., existing in malarious and non-malarious regions ; it is given in the third journal in a rather briefer form than in the other two.

The district investigated was a small region enclosing the southern part of the province of North Holland and the adjacent parts of South Holland and Utrecht. The authors divide this district into, first, the north, where malaria is endemic, and second, the south, where it is absent, or extremely rare. *A. maculipennis* is numerous in both regions, but more so in the north than in the south. It was found, on measuring large numbers of mosquitos from both regions, that the average length of those from the south is the greater. The size of the insects is not influenced by the chlorine contents of the waters in which they breed, nor by temperature, but it is affected to a certain degree by their food. That this is not the only cause of the difference was shown by breeding from the egg mosquitos from both regions under identical conditions, when those from the south still produced larger adults.

As regards biological differences of *A. maculipennis* from the two regions, both showed the same degree of infectibility (13 per cent. with *Plasmodium vivax*). There was, however, a difference in their inclination to take human blood. In June and September those from the south were much less voracious than those from the north, but in August there was little difference between the two. The percentage of females of stable mosquitos with blood in their stomachs (blood-number) in the two regions was found to be greatest (87 and 77 per cent. respectively) in June. In the north it did not decrease till November (29 per cent.), while in the south a decrease occurred as early as September, and in October no mosquitos contained blood. The percentage of females with a well-developed fat-body was high in the south from the beginning of autumn, sometimes above 90 per cent., but it was low, 1–20 per cent., in the north, though these results, except that as regards the blood-number in the north, should, in the authors' opinion, not be accepted as a general rule without further confirmation.

The lack of appetite shown by mosquitos from the south in autumn is not, apparently, a sign of disinclination for human blood, but for blood of any kind, because they are entering a state of complete hibernation. In June, however, cattle are attacked by the maximum number of mosquitos in both regions, and at this period there seems to be a real tendency to avoid human blood, which is more marked in the south than in the north.

The annual malaria epidemic in North Holland occurs in spring, with its maximum in May or June, and cases may occur as early as February, many of the spring cases possibly being the consequence of an infection incurred in the preceding autumn [*R.A.E.*, B, x, 20 ; xi, 200 ; xii, 174]. The mosquitos in the south are prevented by hibernation from taking part in winter infections or in those incurred in spring owing to their disinclination for human blood at that time of the year. The fact that later on they become less fastidious may cause them to incur a malaria infection in early autumn, but complete hibernation, setting in at that time, prevents them from transmitting it immediately to man.

Gahan (A. B.). U.S. Bur. Ent. **Miscellaneous Descriptions of New Parasitic Hymenoptera with some Synonymical Notes.**—*Proc. U.S. Nat. Mus.*, lxxi, art. 4, no. 2676, 39 pp., 1 pl., 3 figs., 8 refs. Washington, D.C., 1927.

The Pteromalid that has been known in various parts of the world as *Mormoniella* (*Nasonia*) *brevicornis*, Ashm., has been found by the author to agree with the description and figures of *Pteromalus abnormis*, Boh., which was described from Europe as probably parasitic on the puparium of a Sarcophagid, and specimens bred from puparia of *Sarcophaga* sp. in France were identical with Ashmead's types. According to Dr. Waterston this species is also synonymous with *M.* (*P.*) *vitripennis*, Wlk., which is the oldest of the three names and must be the one adopted. In the United States *M. vitripennis* occurs from New Jersey and North Carolina to California, and it has also been recorded from Hawaii. A key for distinguishing *Mormoniella* from the related genus *Lariophagus* is given.

Botsford (R. C.). **Mosquito Control Work in Connecticut. Season of 1926.**—*Connecticut Agric. Expt. Sta.*, Bull. 285, pp. 268–275, 1 fig. New Haven, Conn., February 1927. [Recd. May 1927.]

An account is given of mosquito control work carried out in 1926 in the salt marsh areas of Connecticut; about one-third of these at present receives treatment. A table shows the present status of these areas, and details of the work done in the individual towns are given, projected areas for further ditching being indicated on a map.

Eddy (C. O.). **Cyanogas Calcium Cyanide for Housefly Fumigation in certain Types of Building.**—*Jl. Econ. Ent.*, xx, no. 2, pp. 270–281, 1 pl. Geneva, N.Y., April 1927.

Successful experiments have been made with cyanogas calcium cyanide against house-flies [*Musca domestica*, L.] in South Carolina. This material is particularly useful in large rooms such as barns, stables, stores, etc.

The lethal dosage for house-flies is about ½ oz. to 1,000 cu. ft., being slightly less in large rooms with very little leakage and when fumigating at night when the flies are in the upper parts of the room, and more where the amount of leakage is increased, this being greatest in the smaller rooms. As the flies are in the lower and more protected places during the day larger dosages would be needed under such conditions. Dosages higher than 1 oz. to 1,000 cu. ft. would probably never be warranted.

In the experiments described the calcium cyanide was applied as a dust cloud. Small amounts of the material were poured on a piece of cardboard that was slightly cupped as it was held in the hand. The dust was then thrown vigorously and horizontally from the operator so that a dust cloud was formed. The dust was distributed as evenly and uniformly as possible throughout the rooms treated, care being taken that the operator should not have to walk through the dust cloud, though he can do so, if necessary, if he holds his breath. The gas from the dust spreads slowly enough to allow a thorough application of the poison. In certain places where a dust cloud could not be used, or where it was not advisable to allow the dust to fall to the floor, the calcium cyanide was applied as a thin film on papers placed on the floor. Places where flies may be concealed or protected from the gas should have a little dust scattered near them. This will either kill the flies or drive them out into the room. Experiments with flies placed in cages at varying heights in the room show that with dosages under 1 oz. to 1,000 cu. ft. the higher cages contain the largest number of dead flies. Cages placed on tables, especially in corners or near windows, often had fewer dead flies than those on the floor, indicating the importance of scattering a little dust in places where the gas does not circulate well.

Where rooms are fumigated at night, the residue on the floor can be swept up next morning.

Calcium cyanide was used in the author's home, the dust being applied on newspapers. The rooms below and adjacent were occupied at the time of fumigation. No tarnishing of walls or household equipment was ever noted.

Where only a short time is available for fumigation, good results should be obtained in two hours in large rooms.

GLASER (R. W.). **Note on the Continuous Breeding of** *Musca domestica*. —*Jl. Econ. Ent.*, xx, no. 2, pp. 432–433, 2 refs. Geneva, N.Y., April 1927.

Up to the time when the author described his methods of rearing *Musca domestica*, L., for experimental purposes [*R.A.E.*, B, xii, 162] he had been unable to maintain continuous breeding throughout the winter, rearing being impossible from about the middle of December to the middle of April, on account of the deficiency of horse manure in food value for the larvae during those months. Subsequently, however, he found that the addition of a few cubic centimetres of a suspension of yeast cells in water to the manure every two or three days enabled the larvae to mature, and made continuous breeding possible. One pound of commercial yeast cake is placed in 2 litres of water, and the suspension of yeast cells is then transferred to pint milk bottles, sterilised in an autoclave and stored on ice ; it must be shaken vigorously before using. Fresh manure should be used for each generation of flies, and must be kept moist.

MACARTHUR (W. P.). **Old-Time Typhus in Britain.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 8, pp. 487–503, 2 figs. London, April 1927.

This is an outline of the history of typhus in Britain from Anglo-Saxon times onward, in which the disease is identified, by means of prevailing conditions, symptoms recorded and accompanying circumstances, with the great historical outbreaks of famine or jail-fever, any indications of the rôle played by lice as vectors being particularly emphasised.

RIDING (D.) & MACDOWELL (T. W.). **Preliminary Notes on Relapsing Fever in the Anglo-Egyptian Sudan.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 8, pp. 524–529, 1 pl., 1 map. London, April 1927.

Investigations of ninety cases of relapsing fever in Western Dafur during November 1926 led to the conclusion that the causative organisms, spirochaetes varying from 14 to 28 microns in length, were transmitted by lice. Only 5 per cent. of the cases were under 15 years of age, as the children do not wear clothing by means of which infection is carried. Infected lice, of both sexes, were obtained from patients between the fifth and thirtieth days of the disease, which is of three types, the first proving fatal in 48 hours, the second being characterised by heavy mortality and prolonged convalescence in the survivors, and the third being most dangerous so far as the spread of the disease is concerned, as the patient never feels seriously ill and goes about among other villagers. The highest percentage of infected lice was obtained from cases that had been ill between 10 and 16 days, and the proportion varied considerably with the duration of the illness in each case.

Lice collected from clothing that had been spread in the sun survived for about 48 hours when entirely removed from the proximity of the body and placed in a glass tube containing a piece of gauze. The spirochaetes in the coelomic fluid of the louse are much shorter than those seen in human blood. Examination of the peripheral blood of field rats inoculated with blood from patients known to have large numbers of circulating spirochaetes failed to show infection.

The geographical features of the country and the history of the disease in it are discussed, and it is suggested that the fever originated from a neighbouring endemic focus in French Equatorial Africa and spread southwards as an epidemic. The etiology, pathology and symptoms of the disease are described, the mortality rate being 75 per cent. in untreated cases. In addition to treatment, a campaign has been instituted for freeing the population of lice.

LEPLAE (E.). **Organisation et exploitation d'un élevage au Congo belge.**—*Bull. agric. Congo belge,* xvi, no. 3–4, pp. 419–515 ; xvii, no. 2–4, pp. 307–608, 185 figs. Brussels, 1925 & 1926. [Recd. May 1927.]

This account of cattle raising in the Belgian Congo contains chapters on diseases caused by external parasites (pp. 366–370), diseases transmitted by ticks (pp. 386–410), and diseases transmitted by tsetse flies [*Glossina*] (pp. 411–426).

MÜHLENS (P.). **Informe preliminar sobre estudios realizados en los territorios del Chaco y Formosa y en el Paraguay.** [Preliminary Report on Studies in the Argentine Territories of Chaco and Formosa and in Paraguay.]—*An. Dept. nac. Higiene,* xxx, no. 2, pp. 139–146. Buenos Aires, November–December 1924. [Recd. May 1927.]

The scarcity of mosquitos in some provinces of Argentina is ascribed to the abundance of the water-plant, *Azolla.* In one locality larvae of *Anopheles argyritarsis,* R.-D., were taken in a lagoon in which this plant was absent, while other waters near by contained *Azolla* and no larvae [*cf. R.A.E.,* B, xiv, 178].

PETROCHI (J.). **Descripción de un nuevo** *Anopheles.*—*An. Dept. nac. Higiene,* xxx, no. 2, pp. 147–152, 5 figs., 1 ref. Buenos Aires, November–December 1924. [Recd. May 1927.]

A description of *Anopheles bachmanni,* sp. n., has already been noticed from another source [*R.A.E.,* B, xiii, 116].

GLASGOW (R. D.). **Another Intermediary Insect Host of the Giant Thorn-headed Worm of Swine,** *Phyllophaga vehemens,* **Horn (Scarabaeidae), new to the Host List of this Parasite.**—*Ann. Ent. Soc. Amer.,* xx, no. 1, p. 86. Columbus, Ohio, March 1927.

Another Insect Vector of the Giant Thorn-headed Worm of Swine, *Xyloryctes satyrus,* **Fabricius (Scarabaeidae), both Genus and Species new to the Host List of this Parasite.**—*T.c.,* pp. 127–129, 1 pl., 2 refs.

Further studies on intermediary insect hosts of *Macracanthorhynchus hirudinaceus* [*R.A.E.,* B, xiv, 179] have shown that *Lachnosterna* (*Phyllophaga*) *vehemens,* Horn, is a host in which the larval form of

the worm can develop. The cysts developing in this host may persist through the transformations of the insect and be transported from field to field by the flight of the adult beetles.

The eggs of the worm occur in the droppings of infested pigs and are thus washed into the soil by rain, where they may be swallowed by larvae of *Lachnosterna* while feeding on roots. The worm completes its larval development and becomes encysted within the insect, reaching its definitive host and completing development when a pig happens to eat a grub or beetle harbouring the encysted parasite.

The author has recently discovered that *Xyloryctes satyrus*, F., which is found in forests, is also a suitable host for the larval development of the worm, the cysts being able to survive through transformations of the insect host, so that not only fields but forests must now be reckoned as a favourable habitat for the dissemination of *M. hirudinaceus*, wherever swine are pastured on, or have access to, forest land.

Cooley (R. A.). **Montana Insect Pests for 1925 and 1926, being the Twenty-first Report of the State Entomologist of Montana.**—*Montana Agric. Expt. Sta.*, Bull. 200, 26 pp., 2 maps. Bozeman, Mta., January 1927. [Recd. May 1927.]

In one river valley of Montana mosquitos have been very abundant and troublesome for some years past, owing largely to the practice of irrigating various crops. The soil is heavy, and the water leaves pools that are ideal for breeding. At times the water floods the fields for long periods, when mosquito breeding occurs on an enormous scale. Clouds of mosquitos follow the cattle ; milk production is reduced to a minimum, stock raising is interfered with and field labour is often impossible to obtain. Oiling pools and draining off standing water will doubtless alleviate the situation to some extent, but further studies are necessary before operations can be adapted to the different localities.

[Suknev (V. V.)] Sukneff (W. W.). **Kurzer Ueberblick über die Epidemiologie der Pest während der letzen 8 Jahre im transbaikalischen endemischen Pestherd.** [A brief Survey of the Epidemiology of Plague during the last Eight Years in the Transbaikalian endemic Plague Centre.]—*Centralbl. Bakt., Paras. Infekt.*, Ite. Abt., Orig., cii, no. 6–7, pp. 338–347, 3 figs., 26 refs. Jena, 12th May 1927.

Much of the information in this survey has already been noticed [*R.A.E.*, B, xiii, 85 ; xiv, 211]. Geographically, the early cases of human plague correspond with the area of distribution of the tarbagan or Siberian marmot, *Arctomys bobac*, and this animal is undoubtedly the chief reservoir of plague in Transbaikalia, though other steppe rodents may be involved. While *Oropsylla* (*Ceratophyllus*) *silantiewi*, Wagn., occurs only on *A. bobac*, *C. tesquorum*, Wagn , is found both on ground squirrels [*Spermophilus citellus*] and on *Ochotoma daurica*.

Fleas and lice taken from tarbagans killed by plague were found in 1921 to harbour bacilli morphologically similar to the Yersin rods, and in 1922 *Bacillus pestis* was found in fleas and lice from infected animals.

Dyar (H. G.) & Núñez Tovar (M.). **Notes on Biting Flies from Venezuela (Diptera, Culicidae, Psychodidae).**—*Insecutor Inscitiae Menstruus*, xiv (1926), no. 10–12, pp. 152–155, 190. Washington, D.C., 11th April 1927.

The new species described from Venezuela are *Haemagogus* (*Haemagogus*) *celeste*, *Culex* (*Choeroporpa*) *macaronensis*, and *Aëdes* (*Howardina*) *argyrites*. A description is also given of the larva of *Culex* (*Choeroporpa*) *innominatus*, Evans. The synonymy of various species of *Phlebotomus* described in papers previously noticed [*R.A.E.*, B, ix, 124 ; xiii, 36] is discussed. *Fransaia*, n.n., is proposed for the subgenus *Lutzia*, França, nec Theobald [*cf.* however, *R.A.E.*, B, xiii, 192.], the type being *Phlebotomus longipalpis*, Lutz & Neiva, which occurs sparingly in Venezuela.

Komp (W. H. W.). **Observations on *Anopheles walkeri* and *Anopheles atropos* (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xiv (1926), no. 10–12, pp. 168–176, 6 refs. Washington, D.C., 11th April 1927.

During the past several years observations have been made on the distribution, life-history and biology of *Anopheles walkeri*, Theo., and *A. atropos*, D. & K., two apparently closely related species. The latter breeds in salt water and occurs along the Gulf Coast, often in immense numbers, but is apparently very local and seasonal. The adults are vigorous biters, attacking freely any part of the body exposed and biting in broad daylight ; they have even been known to fly some distance from the shore to attack a party in boats. The females are not unusually fragile since many of them survived a journey of over 100 miles and subsequently laid fertile eggs. *A. walkeri* is very similar but breeds exclusively in fresh water ; it occurs in several localities in south-western Louisiana not far from the coast. A few individuals of this species were caught in waters covered with water-hyacinth (*Piaropus crassipes*) in the prairie rice-growing regions of this State. A single attempt to infect a female *A. walkeri* with malaria yielded negative results.

Dyar (H. G.). **Mosquito Notes (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xiv (1926), no. 10–12, pp. 179–182. Washington, D.C., 11th April 1927.

The larva of *Dendromyia* (*Sabethoides*) *prolepidis*, D. & K., from the Panama Canal Zone, is described, and the generic position of this mosquito is discussed. Experiments by Dr. Curry have shown that the larvae are predacious.

Dyar (H. G.). **Note on *Aëdes nearcticus*, Dyar.**—*Insecutor Inscitiae Menstruus*, xiv (1926), no. 10–12, pp. 190–191. Washington, D.C., 11th April 1927.

As a result of examination of the type material of *Aëdes nearcticus*, Dyar, in the Canadian National collection, C. R. Twinn has made this species a synonym of *A. alpinus*, L. [*R.A.E.*, B, xv, 95]. In case it is proved that the type material is mixed, the author here restricts the name *nearcticus* to certain individuals in the U.S. National Museum collection, which are part of the original cotype series.

[Pavlovskiĭ] Pawlowsky (E. N.) & Stein (A. K.). **Experimentelle Untersuchung über die Giftwirkung von** *Paederus fuscipes*, **Curt. (Coleoptera, Staphylinidae) auf den Menschen.** [Experimental Investigations on the poisonous Action of *P. fuscipes* on Man.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 6, pp. 271–282, 4 figs., 9 refs. Leipzig, June 1927.

The contents of this paper are substantially the same as those of one already noticed [*R.A.E.*, B, xv, 44, 100].

Kandelaki (S.). **Zur Fauna der Stechmücken in Transkaukasien.** [The Mosquito Fauna in Transcaucasia.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 6, pp. 291–297, 30 refs. Leipzig, June 1927.

This communication describes—from records in the literature and from the author's own collection (identified by Mr. F. W. Edwards)—the geographical distribution of Culicids and *Phlebotomus* in the region between the Caspian and Black Seas, comprising the three republics of Azerbaijan, Armenia and Georgia.

Anopheles maculipennis, Mg., is universal, is the chief carrier of malaria, and in Georgia occurs up to altitudes of 6,600 ft. *A. superpictus*, Grassi, is recorded from Georgia and Azerbaijan. *A. hyrcanus*, Grassi, var. *pseudopictus*, Grassi, is fairly widespread; in the marshy villages on the Black Sea coast, like *A. maculipennis*, it is remarkably zoophilous, and the cattle are driven from pasture into special sheds before sunset. *A. bifurcatus*, L., and *A. sacharovi*, Favr (*elutus*, Edw.) occur in Georgia and Azerbaijan. *A. pulcherrimus*, Theo., occurs in small numbers in Azerbaijan. *A. plumbeus*, Steph., occurs in Georgia and Armenia.

Transcaucasian species of *Culex* have been little studied. *C. pipiens*, L., is fairly widespread, while the author has taken *C. tipuliformis*, Theo., and *C. theileri*, Theo., in Georgia. *Theobaldia longiareolata*, Macq., was also collected in Georgia. The species of *Aëdes* have received little attention. *Aëdes vexans*, Mg., *A. pulchritarsis*, Rond., and *A. argenteus*, Poir. (*Stegomyia fasciata*, F.) are found in Georgia.

Phlebotomus spp. are fairly widespread, and in many places where they are found various forms of leishmaniasis occur. *P. papatasii*, Scop., and *P. caucasicus*, Marz., are found throughout Transcaucasia; *P. major*, Annandale, and *P. sergenti*, Parrot, occur in Georgia; *P. perniciosus*, Newst., is recorded from Armenia and Georgia; *P. li*, Popov, occurs in Armenia and Azerbaijan; and *P. minutus*, Rond., and *P. dubosqui*, Nev.-Lem., in Armenia.

Hauger (A.). **Behandlung der Sarkoptesräude bei Rindvieh mit Aulin.** [The Treatment with Aulin of Sarcoptic Mange in Cattle.] —*Deutsche tierärztl. Wochenschr.*, xxxv, no. 21, p. 335. Hanover, 21st May 1927.

Aulin, an organic compound containing 52 per cent. of sulphur, is a solution of bisethylxanthogen in a neutral vegetable oil. It has proved effective against mange in cattle due to *Sarcoptes*. One-fifth of the skin surface of each animal was painted with it on each of five successive days, and this treatment was repeated after a two-day interval, about ½ lb. being needed for each animal.

[Bachinskiĭ] Batschinsky (P. E.). **Zur Biologie der Larven von *Anopheles* und *Culex* im Zusammenhang mit der Methode der biologischen Analyse von Kolkwitz-Marsson und Infektionsversuchen der Larven mit Schimmelpilzsporen.** [The Biology of Larvae of *Anopheles* and *Culex* in Connection with the Kolkwitz-Marsson Method of biological Analysis of Water, and Attempts to infect the Larvae with the Spores of Mould Fungi.]—*Hyg. u. Epidemiologie*, Leningrad, 1926, pp. 38–44. [In Russian.] (Abstract in *Centralbl. Bakt. Paras. Infekt.*, IIte Abt., lxx, no. 15–24, pp. 550–551. Jena, 31st May 1927.)

In connection with epidemiological investigations on malaria in Leningrad, 225 samples of water were examined from 1921 to 1924, 160 being analysed by the Kolkwitz-Marsson method [*cf. Internat. Rev. ges. Hydrob. u. Hydrog.*, ii, pp. 126–152, Leipzig, 1909] in order to ascertain what characters were preferred by mosquito larvae and to find out their biological connection with the phytozooplankton. Of these 160 samples 99 contained larvae; 55 contained larvae of *Anopheles* only, 22 larvae of *Culex* only, and 22 larvae of both genera. Anopheline larvae prefer slightly or very slightly dirty waters (the zones of β-meso-saprobien and β-meso-oligo-saprobien). Larvae of *Culex* prefer much dirtier water (the zones of β-meso-α-meso-saprobien) and sometimes acquire the characters of poly-saprobien. If both larvae occur in the same water (the zone of β-meso-saprobien), those of *Anopheles* turn towards the zone of oligo-saprobien, and those of *Culex* to that of α-meso-saprobien. The larvae of *A. maculipennis* can be included in the number of characteristic organisms for the zone of β-meso-oligo-saprobien in the Kolkwitz-Marsson system of classification of waters.

Experimental attempts were made to infect larvae of *Culex* and *Anopheles* with various fungi. In one series of experiments, the larvae were fed with the spores and conidia of *Mucor stolonifer*, *Penicillium glaucum* and *Oidium lactis* in containers with heat-sterilised sand on the bottom and water from the respective water collections, and also in watch glasses (containing similar waters). The larvae in the former series, *i.e.*, under conditions closely resembling natural ones, were not affected, but many of those in the second died, and their intestines were filled with spores, while others were inactive and developed badly. The germination of spores within the bodies of living larvae, however, was not observed, though in the presence of air the spores of various fungi and yeasts germinated in dead larvae. Spores that had passed through the stomachs of *Culex* and *Anopheles* developed freely on an artificial medium in the presence of air.

Moltoni (E.). **Esperienze sulle condizioni di vita delle larve di alcune zanzare nelle pozze d'acqua salata nei dintorni di Cagliari.** [Investigations into the Conditions of Life of Mosquito Larvae in Salt Water Puddles near Cagliari.]—*Natura*, xviii, no. 1, pp. 28–37, 11 refs. Milan, 30th April 1927.

Culicid larvae found in salt-water puddles on the beach in Sardinia proved to be those of *Aëdes caspius*, Pall. (*punctatus*, Mg.). Experiments were made with this species, and its behaviour was compared with that of *Culex hortensis*, Fic., obtained from fresh water.

(K 3388) Wt P2/D45 1,500 9/27 H & Sp Gp 52

A. caspius, which exhibits a marked preference for salt-puddles in Sardinia, can live in water of a degree of salinity greater than that of the sea, though it cannot live in the sea itself owing to the absence of suitable food. The pupae of *A. caspius* and *C. hortensis* are very insensitive to the degree of salinity of water, and produce adults just as if they were in the water where they had lived as larvae, though the pupae of *C. hortensis* died in water saturated with salt such as that from salt-pans. Whereas *A. caspius* requires a certain degree of salinity in the water in order to develop, *C. hortensis* cannot develop in water containing more than about 10 grms. of salt per litre.

PUNTONI (V.). **Studio dei rapporti fra la** *Leptospira icteroides* **(Noguchi) e la** *Leptospira icterohaemorrhagiae* **(Inada ed Ito).** [A Study of the Relations between *L. icteroides* and *L. icterohaemorrhagiae*.] —*Ann. d'Igiene*, xxxvii, no. 5, pp. 261–273, 17 refs. Rome, May 1927.

In this study of strains of *Leptospira icteroides*, the supposed causal agent of yellow fever, and *L. icterohaemorrhagiae*, the causal agent of infectious jaundice or Weil's disease, which included serological tests, the author failed to find morphological, cultural or biological differences between them. Schüffner and Mochtar have reached the same general conclusions [*R.A.E.*, B, xv, 93].

KRAUSSE (A.). **Mückenmittel.** [Anti-mosquito Preparations.]—*Forstl. Flugblätter*, no. 14, 4 pp. Neudamm, 1926. [Recd. July 1927.]

A number of suggested repellents for mosquitos are enumerated, including those recommended by Eckstein [*R.A.E.*, B, ix, 29], though none of them is considered to be efficient for any length of time.

FRANCHINI (G.). **Su di una tripanosomiasi dei cammelli a Giarabub in Cirenaica.** [A Trypanosomiasis of Camels at Giarabub.]—*Pathologica*, xviii, no. 420, p. 481. Genoa, 15th October 1926.

FRANCHINI (G.) & CADEDDU (A.). *Idem* **(Seconda nota).**—*Arch. ital. Sci. med. colon.*, viii, no. 4, pp. 191–193. Tripoli, April 1927.

Camels in the oasis of Giarabub, Cyrenaica, are affected with a form of trypanosomiasis that is due to a very polymorphic trypanosome, morphologically different from *Trypanosoma evansi* or its varieties. *Tabanus agricola*, Wied., is common on infected camels and is probably the vector. A new microfilaria, here described as *Microfilaria cameli*, was also found in the blood of the diseased animals.

In the second paper it is pointed out that while it is not possible to identify this disease with surra, there are various varieties of the latter, such as " Mbori " in the Sudan from which region the camels of Giarabub originally came. Inoculation experiments are being made to enable the trypanosomiasis to be identified. Besides the Tabanid mentioned above, a tick, *Hyalomma aegyptium dromedarii*, Neum., and various blood-sucking flies, including *Culicoides pulicaris*, L., and *C. pictipennis*, Winn., were taken on camels at the oasis.

Walch (E. W.) & Soesilo (R.). **Investigation of a Malarial Epidemic in Tegal, during the first Months of 1926.**—*Meded. Dienst Volksgezondheid Ned.-Indië*, Foreign Edn., 1927, pt. 1, pp. 1–96, 29 photos, 13 figs., 6 refs. Batavia, 1927.

A serious epidemic of malaria occurred at a port on the north coast of Java at an unusual season, owing, it is believed, to the extraordinary drought in 1925. *Anopheles ludlowi*, Theo., was the chief vector, its infection index being 2 per cent. against 0·2 per cent. for *A. subpictus*, Grassi (*rossi*, Giles), which was the most abundant mosquito. A fact not previously observed was that *A. fuliginosus*, Giles, may breed in brackish water with a salt content of 1·7 per cent. The status of *A. aconitus*, Dön., is uncertain, as it has not yet been proved to be a vector.

de Toledo Piza Junior (S.). **Carrapatos transmissores da Babesiose (Piroplasmose) dos animaes domesticos. I.** [The Tick Vectors of the Piroplasmoses of Domestic Animals.]—*Rev. Agric.*, i, no. 2, reprint, 8 pp., 5 figs. Piracicaba (Brazil), January–February 1927.

This is a general account of the morphology of the ticks that transmit the piroplasmoses of domestic animals in various parts of the world.

Erber (M.). **Bijdrage tot het onderzoek inzake de verspreiding der *Filaria bancrofti* in Celebes.** [A Contribution to the Investigation on the Spread of *F. bancrofti* in Celebes.]—*Geneesk. Tijdschr. Ned.-Indië*, lxvii, no. 2, pp. 318–322, 1 map. Weltevreden, 1927.

Besides *Culex fatigans*, Wied., which is the best-known carrier of *Filaria bancrofti*, another possible vector of filariasis in Celebes is *Aëdes amesi*, Ludl., which though scarce everywhere else, occurs in large numbers in the villages most heavily infected with filariasis.

de Souza Pinto (G.). **Estudos sobre a transmissão e diffusão da malaria.** [Studies on the Transmission and Diffusion of Malaria.] —*A Folha medica*, viii, no. 10, pp. 122–125. Rio de Janeiro, 16th May 1927.

Instances are quoted from Brazil showing that the occurrence of Anophelines in large numbers is not necessarily correlated with a high endemicity of malaria.

Liebert (W.). **Die Behandlung der Schafräude mittels Rohöl.** [The Treatment of Sheep Scab with Crude Oil.]—*Deutsche tierärztl. Wochenschr.*, xxxv, no. 24, pp. 379–382. Hanover, 11th June 1927.

Sheep scab can be cured quickly by rubbing in 1 part crude petroleum and 3 parts lime-water. The liquid must be well shaken and warmed in a water-bath. Three applications must be made within 10 days. About 27 fluid oz. are needed per animal for each application, which takes about 4 minutes. Only 18 oz. and 2½ minutes are needed with a modified formula: crude petroleum 1 part, paraffin (kerosene) 1 part, lime-water 4 parts.

Missiroli (A.). **I tubuli del Malpighi nell' *Anopheles claviger*.** [The Malpighian Tubes in *A. maculipennis*.]—*Riv. Malariologia*, vi, no. 1, pp. 1–7, 1 pl., 2 figs., 7 refs. Rome, January–February 1927. (Summaries in Italian p. 185, French p. 187, and English p. 190.)

In a previous paper the functional connection between the Malpighian tubes and the digestive tract in *Anopheles maculipennis* (*claviger*) was discussed [*R.A.E.*, B, xiii, 94], and their structure is dealt with here.

Sepulcri (P.). **La Valle Brian. Contributo allo studio igienico dell' ambiente palustre litoraneo.** [The Brian Valley. A Contribution to the Study of Health Conditions in a marshy littoral Environment.]—*Riv. Malariologia*, vi, no. 1, pp. 72–84, 6 figs. Rome, January–February 1927. (Summaries in Italian p. 186, French p. 189, and English p. 191.)

In a marshy tract of about 2,200 acres on the North Adriatic coast near the mouth of the Piave, Anopheline larvae abound in spite of a salinity of the water up to 23·10 per mille. On an adjoining reclaimed area the inhabitants suffer from malaria, the dwellings and animal quarters being heavily infested with *Anopheles maculipennis*, Mg. (*claviger*, F.), *A. algeriensis*, Theo., and *A. sacharovi*, Favr (*elutus*, Edw.).

Valle (V.). **L'imboschimento delle dune considerato nei suoi rapporti con la necessità di risanamento dalla malaria.** [The Afforestation of Dunes regarded in its Relation to Malaria Control.]—*Riv. Malariologia*, vi, no. 1, pp. 85–90. Rome, January–February 1927. (Summaries in Italian p. 187, French p. 189, and English p. 192.)

The afforestation of dunes is a well-known measure for preventing them from shifting, but attention must be paid to its possible effect on malaria. In Venetia, when acacias were planted, the effect of the wind and spray caused a development of shoots near the ground, and the only Anophelines captured in the neighbourhood were *Anopheles sacharovi*, Favr (*elutus*, Edw.), taken among them. It is suggested that pines and eucalyptus should therefore be more suitable when planting for such purposes.

Wagner (J.). **Ueber die Einteilung der Gattung *Ceratophyllus* Curtis.** [The Division of the Genus *Ceratophyllus*, Curtis.]—*Konowia*, vi, no. 2, pp. 101–113, 4 figs., 10 refs. Vienna, 20th June 1927.

A key is given to the genera into which the original genus *Ceratophyllus*, Curtis, has been divided. *Tarsopsylla*, n. n., is suggested for *Ctenonotus*, which is preoccupied in reptiles. *Ceratophyllus uralensis*, Wagn., is a synonym of *Tarsopsylla octodecimdentatus*, Kol., which has been wrongly considered to be synonymous with *Ceratophyllus fasciatus*, Bosc. A new genus, *Ctenophyllus*, is erected for *Ceratophyllus armatus*, Wagn., *C. subarmatus*, Wagn., and *C. hirticrus*, J. & R., and a new genus, *Myoxopsylla*, for *C. laverani*, Roths.

Lignières (J.). **O estado actual da immunização contra a "Tristeza" bovina na Republica Argentina.** [The Present State of Immunisation against Bovine Piroplasmosis in Argentina.]—*Rev. zootechnica*, Buenos Aires, 15th September 1926. [Translated in :] *Bol. Agric.*, xxviii, no. 1, pp. 69–78. S. Paulo, January 1927. [Recd. June 1927.]

This paper reviews the present position in Argentina of the methods of vaccine immunisation worked out by the author during the past twenty-five years against bovine piroplasmosis, carried by the tick, *Boophilus annulatus australis*, Fuller.

Esaki (T.). **Verzeichniss der Hemiptera-Heteroptera der Insel Formosa.** [List of the Heteroptera of Formosa.]—*Ann. hist.-nat. Mus. natnl. hung.*, xxiv, pp. 136–189, 1 map, 48 refs. Budapest, 23rd November 1926. [Recd. June 1927.]

One of the species in this catalogue is the Reduviid, *Triatoma* (*Conorhinus*) *rubrofasciata*, DeG., which enters dwellings in the evening and attacks man. Sometimes it oviposits in the house, and in that case the larvae feed on human blood, often entering the ear for the purpose.

Szilady (Z.). **Dipterenstudien.**—*Ann. hist.-nat. Mus. natnl. hung.*, xxiv, pp. 586–611, 18 figs. Budapest, 23rd November 1926. [Recd. June 1927.]

The following new Tabanids are among the Diptera dealt with : *Tabanus horváthi*, *T. matsumurae*, *T. esakii*, *T. appendicifer* and *Isshikia trifasciata* from Japan ; *Chrysops sinensis*, Wlk., var. *balteatus*, *T sinensis*, *T. petiolatus* and *T. erberi*, Br., var. *fuscipennis* from China ; *T. tibetanus* from Tibet ; *T. laevigatus* from the Himalayas ; *T. basicallus* from Persia ; *T. armenicus* from Transcaucasia ; *T. freyi* from Transcaspia ; *T. decorus*, Br., var. *amani* from Asia Minor ; *T. vuvang* and *T. tsingvang* from Lake Tsokne ; and *T. peculiaris*, Szil., var. *kröberi* and *Nemorius horváthi* from Turkestan.

Nieschulz (O.). **Ueber die Entwicklung von *Tabanus optatus*, Walk. (Zoologische Beiträge zum Surraproblem, X.).** [The Development of *T. optatus*. (Zoological Contributions to the Problem of Surra, X.).]—*Centralbl. Bakt., Paras. Infekt.*, Ite Abt. Orig., ciii, no. 1–3, pp. 113–119, 4 figs., 3 refs. Jena, 1st July 1927.

The material used for this study of *Tabanus optatus*, Wlk., in Sumatra consisted of larvae obtained from puddles, once in association with *Chrysops dispar*, F., and an egg-mass found on a blade of grass in a marshy meadow. All stages including male and female adults are described. The egg-mass contained over 500 eggs. The larval stage lasted $5\frac{1}{2}$–$6\frac{1}{2}$ months.

Vogel (R.). **Einige Beobachtungen über Zecken Kleinasiens.** [Some Observations on the Ticks of Asia Minor.]—*Centralbl. Bakt., Paras. Infekt.*, Ite Abt. Orig., ciii, no. 1–3, pp. 119–123, 8 refs. Jena, 1st July 1927.

These observations were made in the summer of 1926. *Argas columbae*, Herm. (*reflexus*, F.) was taken in a room at Angora, being a

new record for Asia. It differs very slightly from the European form. *Ornithodorus lahorensis*, Neum., which is new to Asia Minor, was collected in sheep stalls near Angora, engorged individuals occurring in cracks in the timber and walls. Severe and sometimes fatal illness in man was said to result from the bites of *A. columbae* and *O. lahorensis*, leading to the suspicion that relapsing fever carried by the latter was involved. Experiments showed that mice eat ticks of the genus *Ornithodorus*, while spiders and a millepede, *Scutigera coleoptrata*, L., very probably prey on them. *Hyalomma syriacum*, Koch, is very common on the tortoise, *Testudo ibera*, and on lizards. A description is given of the hitherto unknown larva, with notes on the structure of the nymphs. *H. aegyptium*, L., is very common, those near Angora being transitional between the typical form and *H. aegyptium impressum*, Koch. *H. pusillum*, Schulze, was taken on camels. *Rhipicephalus sanguineus*, Latr., is a new record for Anatolia, mature individuals being taken from dog, buffalo, goat, sheep and donkey. The ears of donkeys harboured *Haemaphysalis otophila*, Schulze, together with an undescribed species, *H. angorensis*, Schulze (MS.).

Dunn (L. H.). **Notes on two Species of South American Tick, *Ornithodoros talaje* Guérin-Méne., and *Ornithodoros venezuelensis* Brumpt.**— *Jl. Parasitology*, xiii, no. 3, pp. 177–182, 5 refs. Urbana, Ill., March 1927.

The author has ascertained that the ticks used in transmission experiments with relapsing fever in Panama in 1921 [*R.A.E.*, B, ix, 198] were not *Ornithodorus talaje*, Guér., but a closely allied species, *O. venezuelensis*, Brumpt, and he considers that the ticks recorded by Franco, Toro and Martinez in Colombia in 1911 as *O. turicata*, Dugès, and by Pino-Pou in Venezuela as *O. talaje* [*R.A.E.*, B, x, 158] were also probably *O. venezuelensis*.

Larvae of *O. venezuelensis* placed on man or animals completed their feed and left the host in a comparatively short time, varying from 20 minutes to 3 hours, manifesting no tendency towards remaining attached after becoming engorged, while larvae of *O. talaje* infesting wild rats (*Mus norvegicus*) detached themselves, in some cases, only after four days, and had possibly been attached for some time before the rats were captured. The larvae of *O. talaje* moulted within from two to six days after dropping from the rats, about 43 per cent. moulting on the third day. These observations indicate either that the larvae require several days to become completely engorged or that a part of the moulting period is passed on the host.

Infection was produced in rats inoculated with macerated nymphs of *O. talaje* that had been allowed to feed, in the previous instar, on infected rats. Second stage nymphs of *O. talaje* were placed on an infected rat, from which they took blood, 2 hours and 6 minutes being the longest period of attachment. After moulting, these nymphs were placed on a healthy rat upon which they became engorged in 1 hour and 50 minutes ; spirochaetes appeared in the blood of the rat nine days later.

The author found *O. venezuelensis* commonly in houses in Colombia, while *O. talaje*, which is common on rats in Panama, occurred in three houses only, and he considers that man is the preferred host of *O. venezuelensis*, and that the nymphs and adults of *O. talaje* usually feed on rodents and other animals, only attacking man occasionally.

Consequently, although both *O. venezuelensis* and *O. talaje* have been proved to be capable of transmitting relapsing fever, it is probable that the former is the principal vector in Panama, Colombia and Venezuela.

WEISS (P.). **Die "Espundia," Beitrag zum Studium dieser Hautleishmaniasis in Perú.** ["Espundia," a Contribution to the Study of this cutaneous Leishmaniasis in Peru.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 7, pp. 311–321, 8 figs., 13 refs. Leipzig, July 1927.

The form of cutaneous leishmaniasis known as espundia in Peru ranges from northern Argentina to parts of Central America. It is considered different from another cutaneous leishmaniasis, "uta," which is confined to Peru, occurring inland along the river banks. Notes are given on the pathological aspects and treatment of the disease. The lesions occur in those parts of the body that are habitually uncovered and are thought to be possibly due to a mite, which closely resembles *Trombicula irritans* and is widely distributed in Peru.

TOWNSEND (C. H. T.). **The History, Etiology and Transmission of Peruvian Verruga, with an Outline of the Asexual Cycle of its Causative Organism.**—*West Coast Leader*, 8th March 1927, suppmt. 4 pp., 24 figs. Lima, 1927.

This is a summary of the history of verruga and the work on its vector carried out by the author in Peru [*R.A.E.*, B, i, 163, 203, 221; ii, 29, 48, 144, 176, 186].

An account is given of a case of experimental transmission of the disease to a man who had never entered the verruga region, by means of bites of *Phlebotomus verrucarum*, Towns.

The sandflies are most active between six and nine in the evening, continuing in diminished numbers throughout the night, the greatest seasonal abundance being during the height and close of the summer rains and corresponding to the marked incidence of verruga. They are, however, present throughout the year. The infected zones are marked by fair totals of summer heat and moisture, absence of night fogs and low temperatures during the winter, and freedom from continued strong air currents at all seasons, which are the essential conditions for the life-cycle of *P. verrucarum*.

Some account is also given of an attempt to elucidate the aetiology of the disease by means of a study of the asexual cycle of *Bartonella bacilliformis* in man [*R.A.E.*, B, iv, 123]. Internal eruption results when the sporozoites reach the lymphatic nodes, spleen, bone marrow and liver, as well as the capillaries of the submucous system, carried thither by the lymphatic system on their failure to imbed in the subcutaneous tissues. The sexual cycle of *Bartonella*, which requires a temperature much below that of warm-blooded animals, can almost certainly take place in lizards as well as in *Phlebotomus*,

Although the unique conditions obtaining in the verruga zones of Peru, and the marked specific distinctness and geographical isolation of the vector render it unlikely that verruga will occur naturally in other tropical countries, a verruga patient transported in the fever stage to a new locality, where other species of *Phlebotomus* and similar meteorological conditions to those prevailing in the verruga zones were present,

would constitute a dangerous reservoir of the disease and might result in its establishment in the new locality, particularly if suitable lizards were also present.

HERTIG (A. T. & M.). **A Technique for artificial Feeding of Sandflies (*Phlebotomus*) and Mosquitos.**—*Science*, lxv, no. 1683, pp. 328–329, 2 refs. New York, N.Y., 1st April 1927.

In the course of experiments carried out in China, in the attempt to transmit kala-azar by means of various species of *Phlebotomus*, it was found that one species, *P. sergenti*, only rarely developed the flagellates of *Leishmania* following natural feeds on infected animals. To overcome this difficulty advantage was taken of the fact that sandflies may drink liquids offered them, and a technique was devised for feeding them on rich suspensions of *Leishmania*.

The apparatus consists of a short length of glass tubing with a cork vice at one end for holding the sandfly, and a cork sphere at the other, drilled to hold the feeding pipette. Both corks are turned to hold pieces of glass tubing. The sharpened ends of a strip of sheet brass bent double are thrust into the cork vice and fastened. The cork is then cut longitudinally with a razor, forming the two jaws of the vice, which is kept open by the spring when free, and held securely closed when thrust into the glass tube. The vice end of the tube should be flamed, but the other end left, as any constriction would compress the pipette holder, which must fit lightly when in position with the tube. It is essential, in feeding sandflies, that the opening of the tip of the pipette be just large enough to admit the piercing stylets, but small enough to exclude the labium. Each of the three Chinese species of *Phlebotomus*, *P. sergenti*, *P. major* var. *chinensis* and *P. perturbans*, requires a different size of opening, within rather narrow limits for each. The pipettes are made from pieces of capillary glass tubing of about 0·5 mm. bore. The feeding end is flamed until the opening is of the size required. The entrance canal should be short enough to permit the stylets to penetrate into the lumen of the pipette itself, where they are bathed by a relatively large quantity of liquid, an important feature in connection with blood or serum suspensions.

The sandfly is etherised slightly, fixed in the cork vice by the wings and thrust into the glass tube. Under a dissecting binocular microscope the tip of the previously sterilised pipette is slipped over the stylets, and is then manipulated so that the tip, with the stylets enclosed, carries the proboscis anteriorly, resulting in a bend at its base, which position was found to be essential for rapid feeding. The free end of the pipette is then sterilised in the flame, and a small drop of the suspension is allowed to run in, and blown to the farther end where it immediately surrounds the insect's stylets. Feeding usually begins at once, and is rapidly completed, at times within thirty seconds. A fresh pipette is necessary for each insect, as the tiny opening is sealed by the drying of the suspension.

During the summer of 1926 over 600 sandflies were fed by this method. They are not injured and their subsequent behaviour is quite comparable with that of naturally fed sandflies. Development of the flagellates of *Leishmania* was demonstrated in most of the sandflies fed.

A similar method, details of which are given, was successful in feeding mosquitos.

Hesse (E.). **Sur les "** *Caulleryella*," **Schizogregarines parasites des larves de moustiques.**—*C.R. Ass. franç. Avanc. Sci., Grenoble, 1925,* xlix, pp. 403–407, 4 refs. Paris, 1926.

The four schizogregarines known to be intestinal parasites of mosquito larvae are described, *viz.: Caulleryella anophelis*, Hesse, from *Anopheles bifurcatus*, L., and occasionally from *A. maculipennis*, Mg., in France; *C. pipiens*, Buschkiel, from *Culex pipiens*, L., in Strasburg; *C. annulatae*, Bresslau, from *Theobaldia annulata*, Schr., in Germany and from *Aëdes rusticus*, Rossi (*Ochlerotatus quadratimaculatus*, Macq.) in France; and *C. maligna*, Godoy & Pinto, from larvae, pupae and adults of *Anopheles* (*Cellia*) *argyritarsis* var. *allopha*, Lutz & Peryassú, rapidly causing their death, in Brazil.

Roubaud (E.). **L'éclosion de l'oeuf et les stimulants d'éclosion chez le** *Stegomyia* **de la fièvre jaune. Application à la lutte antilarvaire.**—*C.R. Acad. Sci. France,* clxxxiv, no. 24, pp. 1491–1492, 3 refs. Paris, 1927.

Eggs of *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) may show both a long duration of preservation in dry conditions and a great resistance to hatching when wet. The author found that certain eggs contain active larvae, ready for spontaneous emergence in 3–4 days with the slightest stimulus, such as mechanical agitation, changes in the liquid medium, etc., even in sterile water, while others contain inactive larvae, unfitted for spontaneous hatching, which, in a state of latent life, can withstand for months inside the eggs both lack of moisture and immersion in pure water. Hatching of such eggs only takes place under the influence of an external stimulus, normally exercised in the water by microbic diastases [*R.A.E.*, B, xv, 93].

Certain physical and chemical stimuli can also cause hatching, but the results are poor and inconstant. A weak solution of sodium hypochlorite, however, is comparable in its action to diastases. Eggs remaining for three months in water without hatching, hatch in less than 24 hours in water containing eau de Javelle (a commercial solution of sodium hypochlorite), 1 : 1,000, and in 1–6 days at 1 : 10,000. Freshly hatched larvae die rapidly in these solutions. Weaker dilutions (1 : 20,000) do not cause hatching, while stronger ones (1 : 100) kill the larvae while still in the eggs. The stimulating action of the diastases or of the weak hypochlorite is not due merely to any effect produced by them on the egg-shell. The larvae do not hatch in weak alkaline solutions that soften the shell. The eggs containing active larvae are not different in structure from those containing inactive ones. The difference is essentially that of the physiology of the larvae. The inactive larvae are comparable to the hibernating larvae of Muscids that are made active by sudden stimuli [*R.A.E.*, B, xi, 55]. Diastases and suitable physical or chemical stimuli provoke the movements of hatching of the inactive larvae in the eggs and the resumption of their active metabolism.

The anti-larval measures at present in use allow eggs containing inactive larvae to escape destruction. Laid on the interior wall of water-containers they remain unnoticed, and permanently maintain the danger of the development of the mosquito. Treating such containers with sodium hypochlorite, 1 : 1,000, which causes the emergence and death of the larvae, is an economical control measure.

Vogel (R.). **Ueber drei an Salzwasser angepasste Insektengattungen an der östlichen Mittelmeerküste.** [Three Genera of Insects adapted to Salt Water on the Eastern Mediterranean Coast.]—*Intern. Rev. ges. Hydrob. u. Hydrogr.*, xvii, no. 5–6, pp. 355–356, 5 refs. Leipzig, May 1927.

Aëdes zammitti, Theo., is recorded from the Gulf of Smyrna as breeding in salt water in numbers large enough to cause annoyance.

Strickland (C.) & Chowdhury (K. L.). **A New Species of Anopheline *A. pseudojamesi* common in Bengal.**—*Ind. Med. Gaz.*, lxii, no. 5, pp. 240–243, 5 figs., 3 refs. Calcutta, May 1927.

The larva and adult of *Anopheles pseudojamesi*, sp. n., are described from Bengal. The larva resembles that of *A. pulcherrimus*, Theo., and the adult that of *A. jamesi*, Theo. It breeds in such places as borrow-pits, temporary pools, large tanks, railway cuttings, and a river containing little water and much vegetation. In a six months survey 101 individuals were captured compared with 316 of *A. aconitus*, Dön., and 220 of *A. culicifacies*, Giles.

Panja (G.). **The Production of Oriental Sore in Man by Flagellate Culture of *Leishmania tropica*.**—*Ind. Med. Gaz.*, lxii, no. 5, p. 250. Calcutta, May 1927.

The author has found by intracutaneous injection into man of a week-old culture of *Leishmania tropica* that the flagellate forms of the parasite are infective.

Boyd (M. F.). **Studies on the Bionomics of North American Anophelines. 1. The Number of Annual Broods of *A. quadrimaculatus*.**—*Amer. Jl. Hyg.*, vii, no. 3, pp. 264–275, 2 refs., 4 charts. Baltimore, Md., May 1927.

Studies of the distribution and density of *Anopheles quadrimaculatus*, Say, made at ten-day intervals in North Carolina in 1926, and less regular observations made in Georgia during 1923–1925 show that after the initial appearance of adults, which takes place in April or May in rather small numbers, a marked increase takes place in June or July which is maintained with considerable irregularity until October, when, before frost sets in, a rapid decline takes place. The results for 1923 and 1924 are strikingly similar, while those for 1925 are widely different. In that year an unusually early and heavy production of *A. quadrimaculatus*, at first almost entirely limited to females, and continuing till the end of June, was preceded by torrential rains in January, accompanied by temperatures above the usual, an exceptionally warm February and March and a subsequent drought. In consequence of the continuation of this drought the breeding areas diminished to such an extent that the distribution and density of *A. quadrimaculatus* in July and the subsequent months, normally the phase of maximum abundance, was the lowest noted in the entire period.

Sudden increases in density are probably due to the rapid emergence of many adults from extensive production areas, while the rapid declines suggest that the normal longevity is considerably less than two weeks. Assuming that each peak represents the culmination

of the density of a particular generation, and that increases in male density are a somewhat surer guide to the periods of new emergence, *A. quadrimaculatus* in south-western Georgia may have from 8 to 10 annual generations, January and February being the only months when no broods emerge, while in north-eastern North Carolina at least 7 and perhaps 8 generations occur in a year.

The time of appearance of the first generation, which occurs from 20 to 30 days after the last frost, varies in Georgia from the middle of March to the middle of April. The fourth generation occurs in the middle of June in Georgia and in July in North Carolina, irrespective of the date of the first generation, and subsequent broods vary greatly in magnitude, the peaks being from 20 to 30 days apart. A sustained variation in rainfall seems to be the decisive factor in these variations, and it therefore appears that rain is an important cause of natural mortality among the adults. In Georgia most of the mosquitos destined for hibernation are produced by brood eight, subsequent broods being small.

Confirmatory evidence for the hypothesis drawn from the charts that deficiency of rainfall in summer suppresses the development of the summer generations is afforded by dissection records of natural infection with malaria and of stages of ovarian development, as well as by the artificial rearing of mosquitos. Records of dissections show that when a brood is waxing, or reaching its maximum, stomach infections will be found; when it is waning, gland infections may be found among the older survivors. The likelihood of transmission, therefore, is greater at certain intervals than at others during the transmission season.

CLEARE, jr. (L. D.). **Notes on the Breeding Habits of Two Mosquitos.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 405–409, 1 pl., 1 fig., 1 plan. London, June 1927.

An account is given of observations carried out on the breeding habits of *Anopheles tarsimaculatus*, Goeldi, and *Aëdes taeniorhynchus*, Wied., on a part of the foreshore and the low-lying lands behind it, in the vicinity of Georgetown, British Guiana. Details are given of the contour and vegetation of the area, and the character of the water and its fauna. Howard, Dyar and Knab, on the authority of Peryassú, give 19 per cent. sea water with fresh water as the amount that the larvae of *A. tarsimaculatus* will tolerate to complete a normal development, some larvae being able to survive 20 per cent. for 3 days, and 30 per cent. proving fatal to all in one day. The salinity of the sea water used is not given, but assuming that it was as high as 30 per cent. the above percentages would represent 5·7 gms. sodium chloride per litre for normal development, 6·0 gms. as a tolerable amount and 9·0 gms. as a fatal amount. The salinity obtained in these investigations varied from 11·2–14·3 gms. sodium chloride per litre and is therefore more than double the amount quoted above as a tolerable quantity for this Anopheline.

Aëdes taeniorhynchus will breed in water having a wide range of salinity, having been obtained from waters with a salinity varying from 0·7 to 16·2 gms. sodium chloride per litre. Its habits agree closely with those of the species in its northern habitats, except, perhaps, that in British Guiana it readily enters houses, and the

author has experienced occasions when it was necessary to make smudges of smoke in the houses themselves during the morning and early evening in attempts to repel it.

HAMLYN-HARRIS (R.). **Notes on the Breeding-places of Two Mosquitos in Queensland.**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 411–414, 9 refs. London, June 1927.

In Queensland *Aëdes* (*Stegomyia*) *argenteus*, Poir., breeds in any receptacle holding fresh water, preferably in tanks, roof-gutters, tins old and new (new for preference), water-jugs, and other vessels of a similar nature, both indoors and out, but never in any water lying on the ground. Its choice of wooden vessels, such as barrels, seems to be restricted [*cf. R.A.E.*, B, xiii, 43]. The chief breeding-place in centres of population seems to be the rain-water tank, and it is only very rarely that *A. argenteus* is not found breeding in a defective tank or in one inefficiently screened. The association of *A. argenteus* with *Culex fatigans*, Wied., seems to occur frequently whenever the water in the vessel shows some slight degree of pollution or perhaps a tendency to pH of about 6·5. This is singular, for although *C. fatigans* might be described as an acidophile, *A. argenteus* only rarely seems to select water with an acid tendency. The latter far more frequently chooses spent liquid manure as a breeding-place, not from compulsion but from choice. Vessels, principally old kerosene tins, containing such liquid are usually found in shady spots, such as outhouses, or stowed away under the house, where males are likely to be found. It is improbable that food-supply under these conditions is a factor of importance, since *A. argenteus* is a bottom feeder. The main food supplies of this insect are not yet known, and many of its breeding-places contain none of the usual food materials commonly utilised by other species. It has been recorded that *A. argenteus* is definitely attracted to hay infusion [*R.A.E.*, B, xiii, 185], and since spent liquid manure generally has a similar odour, it seems possible that it contains the same attractive features. No instance has been recorded of this mosquito breeding in fresh manure.

The choice of brick and cement lined places holding water seems to be restricted to two or three species, and the association of *A. argenteus*, *A.* (*Finlaya*) *notoscriptus*, Skuse, and *C. fatigans* with such breeding-places is suggestive in itself. The presence of *A. notoscriptus* is particularly so, since it usually prefers to breed in tree-holes, or in vessels provided with an ample food supply of leaves and plant stems, in jars or flower vases in which the flowers have faded and only a small proportion of water remains. Samples of water taken from such vases in the Brisbane Cemeteries proved to be invariably alkaline, the pH varying from 8·0–9·0. *A. argenteus* rarely selects such water, but examination of 400 vases disclosed the fact that *C. fatigans* breeds most frequently in such collections of water and that now and then *A. argenteus* occurs in association with it (1·25 per cent.), usually in dirty water of which the odour in every case is similar to a hay infusion, with an added characteristic odour resembling that of decaying herbage, which appears to be constant in such samples. It is not known how far the value of any particular water as a breeding-place is enhanced by its natural surroundings or by particles of decaying vegetation giving a suitable landing place during oviposition, but it is fairly certain that mosquitos do not lay their eggs in vases where the water is difficult of access. The

type of water in which *A. notoscriptus* breeds in these cemeteries is apparently the same as that selected by *A. argenteus*, and yet it has not been found associated with either *A. argenteus* or *C. fatigans*. Observations also showed that mosquitos prefer earthenware to glass receptacles, possibly because the latter take up and retain too much heat during the day.

The mosquito predominating in southern and western Queensland is *Anopheles annulipes*, Wlk., for which the following types of breeding-places have been recorded within a three-mile radius of Brisbane: natural water, both permanent and temporary, along the edges of quiescent pools and the more secluded parts of streams; fresh water swamps and slowly trickling water provided with ample vegetable growth; borrow-pits along the sides of roads; water-holes, hoof-marks, etc., sometimes more or less polluted; shallow water in water troughs and barrels containing algae; and finally salt or brackish water. These point to the conclusion that food is the main determining factor in the selection of breeding-places. *A. annulipes* lays its eggs in shallow water and is purely a surface feeder, the young larvae being entirely dependent upon minute vegetable growths or small animalculae that float near the surface, bacteria, particularly the larger varieties, forming an important part of their food. The larvae of associated forms, such as *C. fatigans*, can subsist on very much coarser vegetation as well as decaying organic matter, and are only found in the same water when there is sufficient suitable food available for both species. *A. annulipes* is one of those mosquitos that does not appear to be influenced to any great extent by the cold weather conditions of southern Queensland, and the larvae can be found active at any time of the year. During the coldest days, however, when the temperature is about 60° F., the larvae have a tendency to disappear temporarily until the temperature increases as the day advances. Water from breeding-places of this mosquito seemed to show a definite toleration limit of pH 6·5–7·5 except in one case where the pH rose to 8·0. Certain species of *Nitella* are supposed to be toxic and to make the water in which they occur repulsive to mosquitos, but in one locality there are large patches of this plant in shallow running water in which *A. annulipes* occurs in exceptionally large numbers, and the well-nourished condition of the larvae of *C. fatigans* and *C. annulirostris*, Skuse, found breeding there is evidence that food cannot be scarce in such waters. Under normal conditions *A. annulipes* breeds in natural waters, but it often seems to prefer a condition of semi-pollution and is frequently associated with *C. fatigans*. Other mosquitos with which *A. annulipes* was occasionally found to be associated were *Aëdes* (*Ochlerotatus*) *alboannulatus*, Macq., and *Mucidus alternans*, Westw. *A. annulipes* was probably protected from the latter species, which is predacious, by the vegetation on the edge of the water-holes, but *A.* (*O.*) *vigilax*, Skuse, with which it is most frequently associated, is eagerly devoured by it.

Lloyd (Ll.), Johnson (W. B.) & Rawson (P. H.). **Experiments in the Control of Tsetse-fly. (Report of the Tsetse Investigators in N. Nigeria.)**—*Bull. Ent. Res.*, xvii, pt. 4, pp. 423–455, 2 pls., 6 refs. London, June 1927.

This report is a continuation of one already noticed [*R.A.E.*, B, xii, 160] and gives an account of the work carried out in Northern Nigeria

with *Glossina morsitans* Westw., and *G. tachinoides*, Westw., from January 1924 to May 1926. The district under survey is described, and an account is given of the method of collecting data as a basis on which to estimate the effects of experiment. Before and during experiment flies were collected week by week from foci subject to experimental change and from others employed as controls, the following factors being noticed : the sex proportion in the catch, the rate of catching, the state of nutrition, the proportion of very young flies, the blood contents of the guts, with classification of the kinds of blood taken, and the trypanosome infection. The difference between primary and secondary foci is defined [*R.A.E.*, B, ii, 96], and in this connection one important difference was found between *G. morsitans* and *G. tachinoides*. In the case of the latter the proportion of young flies in the catch is much the same in the dry season at primary and secondary foci, but with *G. morsitans* they are relatively more numerous in the catches in secondary foci. This seems to indicate that the young *G. morsitans* skirting the edge of the forest of the primary foci readily pass the more shadeless bush and reach the secondary foci, but that the young *G. tachinoides*, ranging more along the water's edge and the glades of the thicket, do not make these bold flights. With regard to feeding it is clear that *G. tachinoides* takes whatever blood is available, whether mammal or reptile, while in the case of *G. morsitans*, non-mammalian blood (always avian) is seldom taken under normal conditions.

Details are given of an experiment in which game was excluded from a secondary focus, a briefer account of which has already been noticed [*R.A.E.*, B, xv, 35].

It may be noted that the figures given in the less detailed account as percentages of human blood to the total mammalian blood are here given as percentages of human blood to the total blood taken, the figures given in the previous account showing the percentage of human blood to all the bloods taken being omitted.

Before the area was enclosed *G. morsitans* showed an infection of 19·2 per cent. with *Trypanosoma vivax*, 3·0 per cent. with *T. congolense*, and one fly was found to be infected with one of the *T. brucei-gambiense* group; after enclosure the percentage infection was 14·3 with *T. vivax*, 4·5 with *T. congolense*, and two flies were infected with the *T. brucei-gambiense* group. Among *G. tachinoides* the infection before closing was 5 per cent. with *T. vivax* and 1·3 per cent. with *T. congolense*; and after closing 3·6 per cent. with *T. vivax* and 0·6 per cent. with *T. congolense*. No infection of the *T. brucei-gambiense* group was found after the fence was closed, only one having ever been detected at the spot. There appears to be a definite reduction in figures, 25 per cent. in one species and 50 per cent. in the other, among an adequate number of flies, but the infections remained numerous considering that the source of infection was removed. This was probably due to the invasion of the area by flies from without, though it has been suggested that if game were removed *G. morsitans* would subsist on the smaller mammals and infect them with trypanosomes, and that they would take the place of larger mammals as reservoirs of the disease. This assumes in the first place that the flies could make sufficient successful attacks on these mammals to keep in a thriving condition ; secondly that the trypanosomes would infect the animals ; and thirdly that, being infected, these would act as reservoirs of the trypanosomes. In the first case the small mammals are mostly agile and mainly nocturnal, and while the fly's occasional

successful attacks on them are not doubted, its ability to subsist on them is denied ; the experimental evidence afforded by the fenced area supports this view. As regards the second assumption attention is called to the fact that most trypanosomes are very specialised organisms and do not necessarily live in any animal into which they are introduced. *T. vivax* is the most specialised, as it has been recorded as occurring naturally only in BOVIDAE and EQUIDAE with a single exception, and its sudden adaptation to a life in small mammals is outside the range of probability. *T. congolense* and *T. gambiense* may with difficulty be made to infect small mammals in the laboratory, setting up a long and ultimately fatal disease. *T. brucei* (and *T. rhodiense* if this is considered a distinct species) readily infects the smaller laboratory animals with a disease that is rapidly fatal. It is therefore probable that three out of the four trypanosomes would infect the small mammals if the flies began to feed upon them regularly, but the fact that a fatal disease is set up means that although the fly gets temporary benefit from the supply, it exhausts it by destroying its hosts. If *T. congolense* had kept up its rate of infection in the fly within the fence and *T. vivax* had become relatively scarce, it would have been evidence that the fly was attempting accommodation to smaller mammals ; but the fact that *T. vivax* infections, which formed the large majority of the total infection, remained numerous, shows that it was invasion of the fenced area by flies that kept the rate of infection about normal.

The postponement of grass-burning over large tracts of country, except where forest reserves have been established, is a matter of great difficulty. It has been pointed out that, while such a measure would be worth while if it were certain to lead to the control of tsetse-flies, if carried out over a number of years it would lead to impoverishment of the soil and spoil the grazing. When grass is fired early, the ash is entangled in the stalks that remain and is soaked into the ground by the following rains ; when burning is late, all these stalks are consumed, so that the strong winds that precede the rain sweep the ash from the bare country into the water channels and it is washed away, serious impoverishment of the land resulting. The reasons why it is to the interest of the natives to burn early are discussed, and it is pointed out that restrictions as to grass-burning would so affect the economic life of the people that it is necessary to prove clearly the benefit of late burning before imposing them on a large scale. The three experiments so far attempted are described. The results of one of these have already been noticed [*R.A.E.*, B, xv, 36]. In the dry season of 1925–26 greater precautions could be taken to preserve the grass in an area of approximately 20 square miles, which was subsequently burnt 3–6 months after the normal time. The late sweeping fire resulted in a considerable reduction in the numbers of *G. morsitans* and *G. tachinoides*, and probably a large destruction of their pupae. The density increased rapidly after the fire, and was probably due to invasion from outside the area, since the rate of infection was not lowered, as would have been the case if the increase had been due entirely to breeding. The results of burning are considered to be promising and further experiments are being arranged.

A description is given of the clearing work, a brief account of which has already been noticed [*R.A.E.*, B, xv, 36]. The density of *G. tachinoides* was reduced in 3 months to 48, 37 and 17 respectively instead of about 100. The game largely left owing to the disturbance,

and the proportion of flies containing recognisable blood was low in March and April, but became normal in May, when, owing to the rains having begun, the fly was able to obtain an unusual amount of reptile blood. The proportion of recently emerged flies became unusually high owing to the dearth of old flies, and the rate of infection fell. A similar reduction took place in the numbers of *G. morsitans*. The proportion of recognisable blood was low. The percentage of starving flies rose to 20, 31 and 32 as against 0, 1 and 5 in the previous year. The proportion of recently emerged flies also rose abnormally and the rate of infection dropped.

An attempt was made to introduce *Syntomosphyrum glossinae*, Waterst., which is one of the more successful parasites of *G. morsitans* in Nyasaland, but although large numbers were released on three occasions in December at a spot where *G. morsitans* and *G. tachinoides* were known to breed actively, none of the pupae subsequently examined showed any sign of parasitisation.

KEARNEY (W.). **Report of the Veterinary Pathologist for the Period October 1924 to December 1925 inclusive.**—*Nigeria : Ann. Rept. Vet. Dept. N. Prov. 1925*, pp. 13–22. Lagos, 1926. [Recd. May 1927.]

The following species of trypanosomes, arranged in order of frequency, were found in cattle in Northern Nigeria in 1925 : *Trypanosoma theileri, T. vivax, T. congolense* and *T. brucei*. All cattle harbouring *T. theileri*, which was by far the most numerous of these species but was not pathogenic, were also infected with rinderpest and came from a district where the tsetse-fly [*Glossina*] is unknown. As, however, Hippoboscids are very frequent there at certain periods of the year, it is assumed that these were the probable vectors.

BEVAN (Ll. E. W.). **Southern Rhodesia : Report of the Director of Veterinary Research for the Year 1926.**—Fol., 11 pp. Salisbury, Rhodesia, 1927.

Work carried out during 1926 to ascertain the influence of dipping upon trypanosomiasis has been noticed elsewhere [*R.A.E.*, B, xv, 46]. It would appear from laboratory experiments that the local strain of *Trypanosoma congolense* is of comparatively low virulence, and that animals otherwise healthy exhibit a remarkable tolerance to it. In weak and unhealthy animals it gains in virulence, and this exaltation of virulence is increased by passage from one highly susceptible animal to another. *T. vivax*, a species hitherto rarely met with in Southern Rhodesia, is now more frequently found, especially in one area. Contrary to the experience of other workers it is more deadly and more resistant to treatment than *T. congolense*.

[VUISHELESSKAYA (N. S.).] **Вышелесская (Н. С.). Sodium Arsenite as an Insecticide.** [*In Russian.*]—*Défense des Plantes*, iii, no. 6, pp. 462–467. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

Laboratory experiments have been made with solutions of sodium arsenite, the strengths of arsenic trioxide varying from 42·86 to 98·17 per cent., for the control of insect pests. Mosquito larvae (*Culex* and

Aëdes) were placed in poisoned water and cockroaches were fed on poisoned bread. It proved impossible to prepare a sodium arsenite containing more than 85 per cent. of As_2O_3, so that in order to obtain a higher arsenic content a further amount of arsenic trioxide, which did not react, was added to the solution. The toxicity of the sodium arsenite increases directly with the increase of As_2O_3 that it is able to contain, but the presence of undissolved arsenic trioxide decreases the toxic value. The proportion of alkali present does not influence the toxicity of the compound.

From an examination of the dead cockroaches the lethal dose for these insects is shown to be about 0·118 mg. sodium arsenite containing 85·15 per cent. As_2O_3 or 0·245 mg. containing 42·86 per cent. As_2O_3. In one case, however, a cockroach that had survived was found to contain 1·05 mg. of As_2O_3. It is possible that in cases of very slow poisoning the arsenic may accumulate in the body of the insect.

All mosquito larvae were killed after exposure for 24 hours to water poisoned with sodium arsenite containing 69·33 per cent. As_2O_3 at the rate of 1 gm. per 5,000 cc. [1 lb. to 500 gals.]. At half this strength complete control was obtained with sodium arsenite containing 74·01 per cent. of As_2O_3.

[Traut (I. I.).] **Траут (И. И.) The Use of Chemical Substances for Poisoning Ground Squirrels in the Plague Areas.** [*In Russian.*]—*Défense des Plantes*, iii, no. 6, pp. 537–551, 4 refs. Leningrad, December 1926. (With a Summary in English.) [Recd. May 1927.]

The various substances, such as chlorine, carbon bisulphide, and chloropicrin, used for the destruction of ground squirrels in their burrows, have no effect on their ectoparasites, even when used in much greater concentrations than are required to kill the rodents.

Burrows of various types have been examined, and it has been found that the parasites, particularly fleas and ticks, only occur in those containing a nest that is in a good condition. Though further work in connection with this problem is essential, it is suggested that by tightly plugging the burrows likely to contain the infected parasites, these will be prevented from coming in contact with fresh hosts, and thus transmitting plague.

Pirie (J. H. H.) & Murray (W. A.). **Plague in the North-west of the Cape Province.**—*Jl. Med. Assoc. S. Africa*, i, pp. 50–59, 1 map, 3 graphs. Cape Town, 12th February 1927. [Recd. May 1927.]

This paper gives an account of an outbreak of plague in the north-west of Cape Province in June, July and August, 1926. The epidemic was differentiated from the disease as it has been known in South Africa during the past four or five years by three outstanding features: the rodent reservoir was different; it broke out quite unexpectedly in a district some 250 miles away from the nearest point at which human plague had previously been known; and it commenced in winter, whereas all previous epidemics have started in the summer months. Direct conveyance of infection from one of the previously infected areas, whether by human, rodent or flea agency, can be disregarded on account of the scattered distribution of the cases, most of which occurred on isolated farms. There must, therefore, have been a widespread

reservoir of infection on the spot, and in the absence of domestic rodents the veldt rodents were suspected. There had apparently been a severe mortality among hares, which are fairly numerous, for several weeks prior to the epidemic, and in five cases the patients were known to have handled dead hares shortly before the onset of the disease. The smaller veldt rodents had also been observed lying dead in greater numbers than usual. The presence of plague infection was subsequently established in two species of hares (*Lepus saxatilis* and *L. zuluensis*), the large-eared mouse (*Malacothrix typicus*) and Broom's Karroo rat (*Myotomys broomi*). Definite proof of plague infection was not obtained from any of the Namaqua gerbilles (*Desmodillus auricularis*) examined, although field evidence suggested that there had been a high mortality amongst them. Dead animals were, however, difficult to find, and this fact is in keeping with the opinion that an area occupied mainly by these gerbilles would offer a considerable barrier to plague, since they have been found experimentally to be comparatively insusceptible to the infection. In this case the conditions affecting spread are complicated by the fact that the gerbille is living in close association with the Karroo rat, which is highly susceptible. It does not seem probable that hares are reservoirs of plague infection, since they are comparatively few in number, they do not herd together, and fleas are only found on them in comparatively small numbers. On the other hand, gerbilles or rats usually come to the surface to die, and fleas deserting them might make a temporary host of a passing hare. These animals travel long distances, and a hare becoming infected might drop infected fleas or infect fresh fleas miles from the spot where it became infected itself. Such fleas, might start a fresh focus of infection in the main reservoir of small rodents. Thus it may be taken that the Karroo rat is definitely one of the plague reservoirs, the Namaqua gerbille probably is, and the hares play a part in the dissemination of plague infection. One of the factors that has probably been contributing to the rapid spread of the disease is the diminution of the natural enemies of veldt rodents brought about by man for the protection of poultry and lambs. This has resulted in the rapid increase of the rodents, thus increasing the possibility of contact necessary for spread of the disease by fleas, which were abundant in their nests and burrows.

The meteorological factors upon which the maintenance of a plague epidemic depends are mean temperature and saturation deficiency [*cf. R.A.E.*, B, v, 151]. A suitable mean temperature is one between 50° F. and 80° F. The critical saturation deficiency varies with the temperature, being about 7·5 mm. for a temperature of 80° F., and for the rather lower temperatures here dealt with, about 8 mm. Temperatures below 50° F. are unfavourable for the spread of plague because fleas become inactive and disinclined to move ; moreover they do not imbibe blood so frequently. Such temperatures are also unfavourable in the case of rats, because most of them die without developing a bacillaemia, but whether this is the case with veldt rodents has not been determined. At temperatures above 80° F. fleas appear to clear themselves rapidly of plague bacilli and therefore do not retain for long the power of spreading infection ; moreover, when the proventriculus of a flea is blocked by a plague infected clot, it is unable to retain swallowed blood and soon dies from desiccation when exposed to high temperatures, especially if the saturation deficiency is also high. A high saturation deficiency is also unfavourable for the breeding of fleas.

The average mean temperatures and saturation deficiences for 1921–1925 for Bloemfontein, which have been taken as representative of the Orange Free State, where plague has been most prevalent during the past five years, show that the saturation deficiency is above the critical level of 8 mm. for practically only one month in the year, namely December, whilst the mean temperature falls below the critical level during May, June, July and August. The low temperatures would, therefore, account for the winter stoppage of plague, whilst the September-November rise in temperature, accompanied by a low (although rising) saturation deficiency, is compatible with the commencement of plague epidemics in December. The most favourable combination of temperature and low saturation deficiency occurs from January to April, the months in which plague actually has been most prevalent in this region in the past. From the average mean temperatures and saturation deficiencies for the north-west of Cape Province for the same years it appears that the saturation deficiency is maintained above the critical level in December, January and February. Conditions are not, therefore, favourable for the spread of plague until towards the end of the summer. Mean average temperatures falling below 50° F. (and even then only slightly so) occur only in June and July, while in 1926 the mean temperature only just touched 50° F. in June. A very cold period in July put a temporary end to cases, but there was some recrudescence in August. Taking average conditions, however, autumn would seem to be the most favourable time for plague in the north-west, and winter more favourable than summer. Notes are given on the fleas of the veldt rodents of this district [see next paper].

Ingram (A.). **Plague Investigation in South Africa from an Entomological Aspect.**—*Pubns. S. Afr. Inst. Med. Res.*, no. 20, pp. 222–256, 17 refs. Johannesburg, March 1927.

Entomological work in connection with the investigation of plague in South Africa was carried out during 1925 and 1926 [*cf. R.A.E.*, B, xi, 2].

A list is given of the fleas and other ectoparasites collected from small animals of the veldt and from house rats during the years 1923–26. Many of the animals are parasitised by the same species of flea, particularly in the case of the smaller rodents, which are generally regarded as the principal carriers of plague on the veldt, namely, the gerbilles (*Tatera lobengulae* and *Desmodillus auricularis*), *Mastomys* (*Rattus*) *coucha*, *Rhabdomys* (*Arvicanthis*) *pumilio*, *Leggada deserti*, *Steatomys krebsi*, *Mystromys albicaudatus*, and *Malacothrix typicus*.

The ground squirrel, *Geosciurus* (*Xerus*) *capensis*, like the suricate, *Suricata suricatta*, and the yellow mongoose, *Cynictis penicillata*, harbours the fleas of the lesser rodents as casual parasites only. The springhare, *Pedetes caffer*, seems to be in a class by itself with regard to its ectoparasites, which are few in number and in species. It has been suggested that plague occurring in an uninfected locality shortly after its appearance in a distant area may be due to the ectoparasites of this animal, which is capable of travelling 20–30 miles in a single night, but this idea is open to some doubt when its parasites are compared with those of the other veldt rodents.

The Eastern Karroo rat, *Parotomys luteolus*, though proved experimentally to be susceptible, is very rarely found to be naturally infected with plague, and may possibly owe its freedom from the disease to

the fact that the fleas infesting it differ from those commonly found on veldt rodents. Experience in the field is opposed to the view that the ectoparasites other than fleas found on the veldt rodents and carnivora play any active part in the transmission of plague from these animals to man, though they may do so amongst the animals themselves. Ticks are of comparatively rare occurrence on small rodents, though somewhat more frequently found on the suricate and yellow mongoose, so that they are unlikely to be actively concerned in spreading the disease. Mites are common in the burrows of rodents, especially gerbilles, and, resisting adverse conditions, such as lack of moisture and cold, much better than larval fleas, may be found in nests that appear to have been abandoned for months. However, all efforts made to induce these mites to feed on human blood have, up to the present time, been a failure, and experiments testing their ability to transmit plague from rodent to rodent seemed to indicate that they were not active carriers. Lice are rarely found except on the ground squirrel, and do not leave their host immediately after its death. Since in natural conditions lice are peculiarly limited in their host-relations it appears unlikely that they play an active part in carrying plague from these animals to man.

Two species of fleas were used in longevity experiments, *Dinopsyllus lypusus*, J. & R., and *Chiastopsylla rossi*, Waterst., and the larger flea, *D. lypusus*, showed no greater resistance than the smaller. The average length of life of the fleas under observation was 27 days at a temperature of 77° F., but in a subsequent experiment under somewhat different conditions some fleas survived for nearly two months.

In feeding experiments four species of fleas infesting wild rodents, namely, *D. lypusus*, *C. rossi*, *Xenopsylla cerilli*, Roths., and *X. eridos*, Roths., were induced to bite man after being starved for two or three days. From transmission experiments described it seems justifiable to conclude that *D. lypusus*, *C. rossi* and *X. eridos* are capable of transmitting plague from rodent to rodent, and the seasonal prevalences of plague and of *X. eridos* in the Orange Free State appear to correspond.

Notes are given on the occurrence of the species of fleas in different localities at various times in the year.

A record has been kept for one year of the incidence of fleas on house rats in Johannesburg. The brown rat, *Mus norvegicus* (*Rattus decumanus*) apparently does not occur, all rats examined being *M.* (*R.*) *rattus* or varieties of that species. Six species of fleas are found on these rats, namely *Xenopsylla cheopis*, Roths., *Ctenocephalus canis*, Curt., *Leptopsylla musculi*, Dug., *Ceratophyllus fasciatus*, Bosc., *C. londiniensis*, Roths., and *X. brasiliensis*, Baker. The first four species are known to carry plague, though *L. musculi* very rarely bites man. A recent experiment indicates that *X. brasiliensis* is also a carrier of plague from rodent to rodent but is reluctant to feed on human blood. *X. cheopis* appears to be most plentiful in the early part of the year from February to June.

The effect of saturation deficiency and temperature on fleas is discussed [see preceding paper]. Observations indicate that the meteorological conditions to which fleas are subject in the burrows of wild rodents differ considerably from those prevailing above ground. The temperatures in the burrows are cooler in summer and warmer in winter, and the humidity is greater than that of the atmosphere above ground, while the saturation deficiency is considerably less. Such

conditions are very favourable to the prolongation of the life of fleas living in rodent burrows, even in the absence of their hosts, and it is difficult to see how adverse atmospheric conditions above ground, which act detrimentally upon the fleas of the house rat, can directly influence the spread of plague amongst wild rodents (the fleas of which appear to be nest fleas rather than body fleas), though such conditions are likely to affect the spreading of the disease from rodents to man.

Collections of fleas sent from the principal towns were taken almost exclusively from house and dock rats. *X. cheopis* appears to be the commonest flea at the ports on both *M. rattus* and *M. norvegicus*, others recorded from various towns being *L. musculi*, *X. brasiliensis*, *Echidnophaga gallinacea*, Westw., which was taken in Capetown and East London, and *Ctenocephalus canis*.

During the latter part of June a visit was made to a district in the north-west Cape Province where a recent outbreak of plague had occurred. *X. eridos* was the only flea found on *Desmodillus auricularis*. Its prevalence on this gerbille and its occurrence at this season on the Cape hare, *Lepus capensis*, and the Karroo rat, *Myotomys broomi*, in conjunction with the scarcity of *C. rossi* and the absence of *D. lypusus*, make it highly probable that it was the principal agent in spreading plague during the recent outbreak. *Ctenocephalus canis*, the only other flea found on the Cape hare, is also an efficient carrier and not infrequently bites man. The fleas found on the Karroo rat or in its nests, were, in order of frequency of their occurrence, *Chiastopsylla mulleri*, Ingr., *Listropsylla agrippinae*, Roths., *C. rossi*, *X. eridos* and *Hypsophthalmus aganippes*, Roths.

Fully 80 per cent. of the fleas taken from the nests of the Eastern Karroo rat in October and April at Steynsburg were *C. pitchfordi*, Ingr., while of those taken on the Karroo rat in July and August, 85 per cent. were *C. mulleri*. A possible explanation of the natural freedom from plague of the Karroo " water " rats is that the fleas most prevalent on them are peculiar to themselves, not having been found, up to the present time, on the other veldt rodents ; yet, though they occur in much smaller numbers, both *X. eridos* and *C. rossi*, which are capable of transmitting plague, are found on these rodents. It has not been ascertained whether *C. pitchfordi* or *C. mulleri* are able to carry plague or not.

MITCHELL (J. A.). **Department of Public Health. [Report for the] Year ended 31st June, 1926. Malaria. Plague.**—*Union S. Afr., Ann. Deptl. Repts. 1925–26*, no. 6, pp. 164–171. Pretoria, 1927.

Little malaria occurred in the endemic areas in South Africa, though there was serious localised prevalence in Zululand and the northern Transvaal. The following species of Anophelines were recorded from various districts in the northern Transvaal during the year : *Anopheles pretoriensis*, Theo. ; *A. maculipalpis*, Giles ; *A. rufipes*, Gough ; *A. squamosus*, Theo. ; *A. mauritianus*, Grp. ; *A. marshalli*, Theo. ; *A. transvaalensis*, Cart. ; *A. natalensis*, Hill & Haydon ; *A. gambiae*, Giles (*costalis*, Theo.), found in streams and native dwellings (this species was proved to be the vector in a serious outbreak of malaria in Natal in 1905) ; and *A. funestus*, Giles, found in a river and in native huts in its vicinity. The discovery of this species is of special importance, since, from its habits and activities in Central Africa and elsewhere,

it may be found to play an important part in certain localities in carrying the infection over from one malaria season to the next.

An account is given of the investigations on the occurrence and transmission of plague [see preceding paper].

CHAMBERLAIN (W. P.). **Sanitation of Panama Canal Zone. Permanent Drainage and Mosquitoes.**—*Military Surgeon*, lx, no. 4, pp. 397–422, 2 pls., 2 maps. Washington, D.C., April 1927.

The history of the sanitary measures that have been carried out against malaria, etc., in the Panama Canal Zone are briefly reviewed, and the present status of the problem is discussed [*R.A.E.*, B, xv, 104].

MCMURDO (H. B.). **Construction and Use of the Fly Trap Stand.**—*Military Surgeon*, lx, no. 4, pp. 423–424, 1 pl. Washington, D.C., April 1927.

A fly-trap stand here described was used with much success at a camp in California, where flies were troublesome in the vicinity of the stables. The stand is constructed of three boards nailed together at right-angles, forming two sides and a flooring, the floor being raised 4 in. from the ground with a block nailed to the free angle to supply a third leg. The sharp angle of this stand pointed to windward provides a sheltered landing point for flies; the bait remains in good condition with greater concentration of odour; the trap is protected from breakage and is easily movable; the lower portion is slightly shaded, leaving the upper portion lighter by contrast. The stands appear to increase in value after a few days, probably because the boards absorb some of the odour from the bait. The bait generally used was melon rind with wet bran. The fly in evidence was almost exclusively *Musca domestica*, L. After four hours the trap on a stand had caught several times as many flies as other traps without the stand.

EDDY (C. O.). **House-fly Fumigation in certain Types of Buildings.**—*S. Carolina Agric. Expt. Sta.*, Bull. 237, 14 pp., 3 refs., 3 figs. Clemson College, S.C., April 1927.

The bulk of the information contained in this paper on fumigation with calcium cyanide against house-flies [*Musca domestica*, L.] has already been noticed from another source [*R.A.E.*, B, xv, 147].

REH (L.). **Ungewöhnliches Massen-Vorkommen von Fliegen in Häusern.** [The unusual Mass-Occurrence of Flies in Houses.]—*Zeitschr. Desinfektions- u. Gesundheitswesen*, 1927, no. 6, reprint, 4 pp. Königsbrück, 1927.

Besides the various flies that are common in houses in Germany, certain other species may occasionally invade dwellings and cause considerable annoyance simply on account of their enormous numbers. They include not only Muscids, particularly *Musca autumnalis*, DeG., but also Chloropids, and a list of the latter that have been recorded as invading houses is given. They were probably attracted by the warmth of the dwellings. Fumigation with sulphur dioxide or hydrocyanic acid gas is advised in the rare cases where measures become necessary.

Lloyd (H.). **Identification of Flies found infesting Bluebirds.**—*Canad. Field Nat.*, xli, no. 5, p. 111. Ottawa, 17th June 1927.

The larvae of flies taken from nesting bluebirds in Quebec [*R.A.E.*, B, xi, 99] have been recently identified as *Phormia* (*Protocalliphora*) *splendida*, Macq., and not *P. azurea*, Fall. (*chrysorrhoea*, Macq.).

Curran (H. C.). **Two New Species of** *Pelastoneurus* **from the Belgian Congo.**—*Rev. zool. afr.*, xv, pt. 1, pp. 93–94. Brussels, 1st April 1927.

Collart (A.). **Sur un Diptère culiciphage du Mayumbe.**—*T.c.*, pt. 2, pp. (31)–(32), 3 refs. 1st June 1927.

The Dolichopodids, *Pelastoneurus schoutedeni*, sp. n., and *P. collarti*, sp. n., are described from the Belgian Congo. Adults of the latter have been observed at a stream moving about on the surface of the water and capturing mosquito larvae, on which they feed.

Nitzulescu (V.). **Contribution à l'étude des Corizoneures. L'appareil buccal de** *Corizoneura schwetzi* **et de** *C. inornata*.—*Rev. zool. afr.*, xv, pt. 2, pp. 200–213, 13 figs., 7 refs. Brussels, 1st June 1927.

The buccal apparatus of *Corizoneura schwetzi*, Aust., and *C. inornata*, Aust., is described. This is of particular interest owing to divergent opinions regarding the method of feeding in Tabanids [*R.A.E.*, B, vi, 99]. I. L. Mitter observed that *C. longirostris*, Hardw., does not utilize the labium either to pierce the skin or to suck blood [*R.A.E.*, B, vi, 131] while J. Schwetz pointed out in two papers already noticed [*R.A.E.*, B, vii, 80 ; viii, 24] that *C. schwetzi* and *C. inornata* drive the labium into the skin, but do not suck blood until the stylets enter the puncture, and that the sucking is always done by means of these. Comparison of the three species showed very little difference in their anatomy, and the labia of *C. schwetzi* and *C. inornata* do not appear to be more suited for piercing than that of *C. longirostris*. The reason why the two former species drive the labium into the skin, since it is not used for sucking and must make piercing more difficult for them and more painful for their victims, cannot be explained without further research.

Larrousse (F.). **Description d'une nouvelle espèce de** *Rhipicephalus* **du Congo belge,** *Rhipicephalus schwetzi*, **n. sp.**—*Rev. zool. afr.*, xv, pt. 2, pp. 214–216, 1 fig. Brussels, 1st June 1927.

Both sexes of *Rhipicephalus schwetzi*, sp. n., are described from bush pig in the Belgian Congo.

Neukomm (A.). **Action des rayons ultra-violets sur les bactéroides des blattes** (*Blattella germanica*).—*C.R. Soc. biol.*, xcvi, no. 14, pp. 1155–1156, 1 ref. Paris, 6th May 1927.

When subjected to the action of ultra-violet rays, the bacterioid bodies occurring in *Blattella germanica*, L., gradually lose the property of absorbing gram. Since bacteria exhibit a similar reaction the author considers that these experiments afford further evidence of the bacterial nature of these organisms [*R.A.E.*, B, xv, 90].

PUNTONI (V.). **Rapports entre** *Leptospira icteroides* (**Noguchi**) **et** *Leptospira icterohaemorrhagiae* (**Inada et Ido**).—*C.R. Soc. biol.*, xcvi, no. 14, pp. 1139–1141. Paris, 6th May 1927.

This information has already been noticed from a more detailed account [*R.A.E.*, B, xv, 154].

HUGUIER (A.). **Les pédiculoses de nos animaux domestiques.**—*Vie agric. & rur.*, xxx, no. 22, pp. 344–345, 7 figs., 3 refs. Paris, 29th May 1927.

A brief popular account is given of the lice attacking domestic animals and of the injury they cause. The measures recommended for control include the isolation, grooming and clipping of infested animals, together with frequent washings with warm cresyl (at the rate of about 1 oz. to 1¾ pts.). For small animals and poultry repeated dusting with powdered pyrethrum, sulphur, lousewort [*Delphinium staphysagria*] or cevadilla [*Schoenocaulon officinale*] is recommended. Stables, chicken runs, etc., should be washed with water and soda and then whitewashed with lime-wash to which cresyl has been added at the rate of 4 : 100. An egg-shell filled with cotton-wool soaked in turpentine and closed with wax may be placed in the nests of laying hens to repel the lice.

COLLINGE (W. E.). **Agricultural Pests and Plant Diseases observed in Yorkshire during 1926.**—*Jl. Yorks. Agric. Soc.*, 1927, reprint 21 pp., 8 figs.

The horse louse, *Haematopinus asini*, L. (*macrocephalus*, Burm.), usually attacks the mane, neck and root of the tail. In the case of a severe attack the hair should be clipped and the skin treated with a 1 to 5 per cent. aqueous solution of creolin, the application being repeated 5 or 6 days later.

WALTON (C. L.). **Further Notes on Warble Flies in North Wales.**—*Welsh Jl. Agric.*, iii, pp. 164–169, 8 refs. Cardiff, January 1927. [Recd. June 1927.]

This is a continuation and extension of a paper on the warble-flies, *Hypoderma lineatum*, Vill., and *H. bovis*, DeG., attacking cattle in North Wales [*R.A.E.*, B, xiii, 139]. If both these flies are present in a herd (as is not infrequently the case) the period during which they may be found is much extended, and may last from February until July, owing to the fact that *H. lineatum* appears earlier in the spring than *H. bovis*. This necessitates a much longer series of treatments than would be required if only one species were present.

An ointment consisting of one part derris powder to two parts vaseline [*R.A.E.*, B, x, 122] was tested. Its toxic properties appear to be excellent, it is odourless and cheaper than the iodoform ointment, but it was found to be much more difficult to apply. The substitution of one part of olive oil for one part of vaseline improved the texture and rendered application easier. While a considerable number of larvae treated with iodoform ointment project from the orifices and can readily be removed, larvae killed by the derris powder tend to remain in the hide, together with some pus, healing being delayed. By applying slight pressure the dead larvae can be squeezed out.

BOGDANDY (St. v.). **Ausrottung von Bettwanzen mit Bohnenblättern.** [Exterminating Bed-bugs with Bean Leaves.]—*Naturwissenschaften*, XV, no. 22, p. 474. Berlin, 3rd June 1927.

An effective means of clearing a room of bugs [*Cimex*] practised in the Balkans, consists in spreading thickly the floor of the infested room with bean leaves, with the lower, hairy side uppermost. The insects crawl on to the leaves and remain there inactive, and may thus be collected and destroyed.

YOUNG (C. W.) & HERTIG (M.). **The Development of Flagellates in Chinese Sandflies** (*Phlebotomus*) **fed on Hamsters infected with** *Leishmania donovani*.—*Proc. Soc. Exper. Biol. & Med.*, xxiii, pp. 611–615. [New York.] (Abstract in *Bull. Inst. Pasteur*, xxv, no. 8, p. 357. Paris, 30th April 1927.)

The technique employed in rearing and feeding sandflies is described. *Phlebotomus major* var. *chinensis*, Newst., and two other species designated as C and B are dealt with. None of the sandflies caught in nature were infected with flagellates. *Phlebotomus* C [identified in the next paper as a variety of *P. sergenti*, Parrot] was fed on kala-azar cases and hamsters (*Cricetulus* spp.) and then dissected after intervals of 3 and 8 days. Flagellates were present in 7 out of 232 individuals fed on the hamsters. Of the 34 individuals of *P. major* var. *chinensis* fed on hamsters, 29 showed flagellates, most of which were in the oesophagus or the anterior portion of the mid-gut [*R.A.E.*, B, xv, 41]. None of the 11 individuals fed on kala-azar patients became infected.

PATTON (W. S.) & HINDLE (E.). **The Development of Chinese** *Leishmania* **in** *Phlebotomus major* **var.** *chinensis* **and** *P. sergenti* **var.**—*Proc. R. Soc.*, Ser. B, ci, no. B 710, pp. 369–390, 5 figs., 11 refs. London, 2nd May 1927.

Previous literature on the subject of flagellate infection of sandflies is reviewed. The species recorded by Young and Hertig [see preceding paper] as *Phlebotomus* C has been identified as the Mesopotamian variety of *P. sergenti*, Parrot.

The method of handling the sandflies in these experiments was similar to that used by the above authors; they were placed in rectangular cages, made of silk bolting cloth (no. 40 mesh) and provided with a sleeve, suspended in a wire frame. The life of the insects may be prolonged in these cages by covering the cage with a damp cloth. They were always transferred as soon as possible to earthenware breeding pots or feeding boxes. A special pipette used for this purpose is described; it consists of two glass tubes, fixed one inside the other, the inner one being slightly shorter. A plunger of capillary glass tubing is placed in the inner tube and kept in position by a tight piece of rubber tubing and packing of cotton wool. The flies are caught in the large open end of the pipette and expelled into the feeding box or other container by blowing through the plunger. The breeding pots and feed-

(K3400) Wt F 2/D 45 1,500 10/27 H & Sp Gp 52

ing boxes are also described ; and a detailed account is given of the method of feeding the flies and of their examination and dissection.

In the feeding experiments the sandflies were all caught in nature, so that the majority of them had already fed. Of *P. major* var. *chinensis* 102 individuals were fed on 7 cases of kala-azar, which with one exception, were of long duration. The flies were subsequently examined, after being kept for 2 to 8 days at a temperature of 30° C. [86° F.] without being refed ; only 5 showed any subsequent development of flagellates, which were confined to the mid-gut. Four of these positive flies were obtained among 12 fed on the recent mild case.

P. major var. *chinensis* was also fed on infected hamsters. After feeding the flies lived equally well at either room temperature of approximately 30° C. or in a cool incubator at 20° C. [68° F.], but the development of the flagellates and the digestive process were more rapid at the higher temperature. The longest period they could be kept alive after feeding was 10 days; the majority however, died within a week. Of 157 flies dissected flagellates were observed in 122. It is possible that in some of the negative results the flagellates had disappeared owing to degeneration of the contents of the gut following death of the insect. It is believed that the ingestion of living *Leishmania* invariably produces infection of the alimentary tract in this sandfly, and there is strong presumptive evidence that it is a transmitting agent of kala-azar in North China. In most cases the flagellates were confined to the mid-gut, but in 5 sandflies flagellates were found extending into the pharynx, and in 2 of these they were in the buccal cavity in the neighbourhood of the opening of the salivary duct. In 1 case flagellates were observed in the oesophageal diverticullum, and in 3 cases the infection extended backwards into the intestine, including one in which it was also observed in the faeces. The few flies that were refed showed very heavy infections.

Experiments with *P. sergenti* var., in which 202 individuals were fed on 8 cases of kala-azar, all proved negative. As a number of the flies were dissected more than 3 days after feeding, it is possible that the infection may have died out, especially as experiments on hamsters showed that very little undigested food material remained in the mid-gut 3 days after a full meal, while some flies would even feed again after 2 days. The digestive process is much more rapid than in *P. major* var. *chinensis*, in which undigested blood persisted in the gut for at least seven days. This species requires a correspondingly longer interval before it can be refed. *P. sergenti* var. will feed at least 4 times. In 1,170 individuals fed on hamsters, the infection rate was about 36 per cent. The parasites were restricted to the mid-gut, except that in 2 individuals they were present in the hind-gut. As a rule they only persist as long as food material remains in the alimentary canal, after which they die out unless the insect is refed. When it is refed, the infection may persist indefinitely. The proportion of sandflies becoming infected varies from entirely negative to almost all positive results. The difference between these results and those of Young and Hertig [*loc. cit.*], who record an infection rate of only 3·3 per cent. for *P. sergenti* var. fed on hamsters, is probably explained by the fact that owing to the long interval allowed by these authors between feeding and dissection many of the infections would have died out.

The seasonal occurrence of the sandflies in China is briefly discussed [*cf. R.A.E.*, B, xv, 41].

RAMAN (T. K.). **Kala-azar in Madras.**—*Madras Med. Coll. Mag.*, vi, no. 4, pp. 273–294, 3 pls., 3 graphs, 11 refs. Madras, March 1927.

A section of this paper (pp. 288–293) deals with the bionomics of the sandfly, *Phlebotomus argentipes*, Ann. & Brun., in Madras under natural and artificial conditions, the details of the life-history in the laboratory agreeing in the main with those given by other investigators [*R.A.E.*, B, xiv, 138–140, 145]. On the only occasion on which the author observed a sandfly during the whole process of feeding on the hand of a patient, the time taken was 5 minutes. Considerable difficulty was experienced in inducing the flies to feed twice, and a third feed could not be obtained. The females fed much more readily when males were also present in the cage. Mating takes place either before or after feeding, usually before. Unfed females were rarely found in cow-sheds, from which the author concludes that either all the females get the opportunity of feeding or they feed more than once.

In Madras *P. argentipes* is scarcest at the hottest and coldest seasons of the year. Large numbers were taken in July, August and September, but very few could be found in December and January and none at all in part of May and the whole of June, although an increase took place in April. Adults were caught in cow-sheds, stables and fowl houses, and in sleeping rooms both on the ground floor and on the first floor at a height of about 15 feet from the ground. No correlation between the maximum abundance of *P. argentipes* and the seasonal incidence of kala-azar is apparent.

ESDAILE (P. C.). **Economic Biology for Students of Social Science. Part I. Harmful and Useful Animals.**—8vo, xv+175 pp., 150 figs. London, Univ. London Press Ltd., 1927. Price 7*s.* 6*d.* net.

The author disclaims the description " text-book " for this popular work, which presents a study in biology as applied to household and social science and is designed particularly for the use of teachers of household science or those engaged in sanitary or hygienic work. It is a compilation of facts concerning insects and other animal organisms closely associated with man and the household. Many of the figures are original camera lucida drawings made from rearings in the laboratory. The volume is supplied with a glossary of scientific terms and an index.

SILER (J. F.), HALL (M. W.) & HITCHENS (A. P.). **Dengue: Its History, Epidemiology, Mechanism of Transmission, Etiology, Clinical Manifestations, Immunity and Prevention.**—*Philippine Bur. Sci.*, Monogr. no. 20, 8vo, viii+476 pp., 8 pls., 97 figs., 38 pp. refs. Manila, 1926. [Recd. July 1927.]

This work has already been noticed from another source [*R. A. E.*, B, xiv, 124]. In its present form, it includes an appendix containing systematic descriptions of the mosquitos studied, namely, *Culex fatigans*, Wied. (*quinquefasciatus*, Say) and *Aëdes argenteus*, Poir. (*aegypti*, L.), details of breeding experiments, records of findings of the species, and histories of experimental dengue cases.

LEGENDRE (J.). **Au sujet de la dengue ouest-africaine.**—*Bull. Soc. Path. exot.*, xx, no. 4, pp. 320–322, 4 refs. Paris, 1927.

After two years of observation in the Upper Volta region, the author is convinced that *Aëdes argenteus*, Poir., and not *Phlebotomus*, is the vector of dengue fever, not only in French West Africa but also in French Equatorial Africa and Madagascar. He bases his conviction on the lack of clinical similarity between dengue and sandfly fever, and on the fact that while *A. argenteus* is numerous, sandflies are extremely rare in districts under his observation where dengue is prevalent. He maintains that Sudanese dengue, of which Suldey considers the sandfly to be the probable chief vector [*R.A.E.*, B, xv, 63], is identical with the disease in the Upper Volta, and disagrees with this theory of transmission both on clinical and entomological grounds.

Dengue fever has been suppressed in one town solely by means of controlling *A. argenteus*, without any attention being paid to *Phlebotomus*, which is of rare occurrence in this region.

LEGENDRE (J.). **Sur l'existence de Phlébotomes à Ouagadougou (Haute-Volta).**—*Bull. Soc. Path. exot.*, xx, no. 4, pp. 342–344. Paris, 1927.

In twenty-two months of systematic search the author found only ten specimens of *Phlebotomus* in a town in the Upper Volta region, nor was its presence reported by any European residents. No disease resembling sandfly fever occurred, though a severe epidemic of dengue attacked 50 per cent. of the European population at a time when *Phlebotomus* was particularly rare [see preceding paper]. The summer, which in West Africa corresponds with the rainy season and lasts 4 or 5 months, is unfavourable to the development of *Phlebotomus*, while *Aëdes argenteus*, on the contrary, is rarely seen in the dry season, which does not suit the adults.

VAN THIEL (P. H.). **Sur l'origine des variations de taille de l'*Anopheles maculipennis* dans les Pays-Bas.**—*Bull. Soc. Path. exot.*, xx, no. 4, pp. 366–390, 13 refs. Paris, 1927.

This paper describes investigations into the differences in the races of *Anopheles maculipennis*, Mg., only adult females being considered, as found in malarious and non-malarious regions of Holland, which agree in the main with others recently noticed [*R.A.E.*, B, xv, 21, 145]. A comparison of adult females from different districts and of the salinity of their breeding-places showed that salinity of the water in which they bred was not directly responsible for the smaller size of those from some localities as compared with others, but a comparative study of the plankton in the breeding-places suggested that it may affect the size of the adults, although this needs further investigation. The difference in size is, however, maintained in mosquitos of the two types reared from the egg under similar conditions.

Most of the author's researches were carried out with mosquitos from Leyden (South Holland), where there is no endemic malaria, and from Bolsward (Friesland), where there is much endemic malaria, but the extension of the investigations to other localities confirmed the theory of the existence of two distinct races, differing not only in size and in the number of maxillary teeth [*R.A.E.*, B, xiv, 82], but also in

colour ; the last character was perhaps the most important, as in one locality in Friesland where the water in the breeding-places was fresh, mosquitos of the light type were as small as some of the dark type in other localities. The two races are not entirely separated as regards distribution, a few of each occurring where the other is predominant. Not all the localities in which the dark race occurs are malarious.

Attempts to determine the comparative infectibility of mosquitos from two localities by allowing them to feed on a malarial subject carrying gametes of *Plasmodium vivax* in the blood failed to yield results beyond demonstrating the greater avidity for human blood of the smaller race.

The author proposes for the Bolsward variety the name *A. maculipennis* var. *atroparvus*, distinguished morphologically from the type by the smaller size of its wings, the larger number of its maxillary teeth and its darker colour. The females of the variety are more vigorous biters than those of the type, and they begin to go into hibernation in November, in contrast to those of the type, which go into hibernation in September or October ; they appear to prefer slightly brackish water for breeding.

Missiroli (A.) & Hackett (L. W.). **La regressione spontanea della malaria in alcune regioni d'Italia.** [The spontaneous Regression of Malaria in some Regions of Italy.]—*Riv. Malariologia*, vi, no. 2, pp. 193–243, 6 figs., 13 refs. Rome, March-April 1927. (With Summaries in French, p. 487, Italian, p. 483 and English,p. 491.) [Recd. July 1927.]

This investigation on the spontaneous regression of malaria was made in four widely separated areas in Italy in order to ensure independence from local conditions. In all of them *Anopheles maculipennis*, Mg., was scarce in dwellings but very numerous in animal quarters. It is suggested that *A. maculipennis*, living originally in the open on animals, became harmful to man when it began to become domestic. Later, following the practice of constructing shelters for animals, it once more developed its primitive instinct for the latter. It enters houses to seek shelter and very rarely bites man. This adaptation to animals is only gradually developed and cannot be immediately induced by the introduction of animals into a malarious locality, but once established, it is not readily lost. In experiments in which the animals were removed, the numbers of mosquitos entering houses was not increased. *A. hyrcanus* var. *pseudopictus*, Gr., on the other hand, is definitely an open-air species, with much less specialised food-preferences ; it enters animal quarters solely in search of prey and not in order to shelter. It is therefore not considered to be important as a vector of malaria.

Counts made to ascertain the dispersion of *A. maculipennis* showed that there is an almost complete redistribution of the mosquitos after each meal and the subsequent digestive rest. Of the mosquitos resting in a stable, 75 per cent. leave it at nightfall and only a few return.

A comparison is made between the results in one of the above four districts where only 0·25 per cent. of the Anophelines contained human blood and the malarious Pontine marshes where about 10 per cent. contained human blood ; and it is estimated that the danger of the transmission of malaria in such an area as the former is practically negligible.

Pecori (G.) & Escalar (G.). **Relazione sulla campagna antimalarica del 1926.** [Report on the Anti-malarial Campaign in 1926 in the Government District of Rome.]—*Riv. Malariologia*, vi, no. 2, pp. 244–267, 1 map. Rome, March-April 1927. (With Summaries in Italian, p. 483, French, p. 487, and English p. 491.) [Recd. July 1927.]

The work described here included the detection and treatment of malaria cases, drainage, the destruction of mosquito larvae by oiling, dusting with Paris green or using larvicidal fish, and the capture of hibernating mosquitos. The beneficial results of the work are indicated by an increase in population and a decrease in death rate and malaria cases.

Ottolenghi (D.) et al. **Intorno all'azione esercitata dalle bonifiche sull' endemia malarica nel Ferrarese.** [On the Influence of Reclamation Work on the Endemicity of Malaria in the Ferrara District.]—*Riv. Malariologia*, vi, no. 2, pp. 268–343, 10 figs., 17 refs. Rome, March-April 1927. (With Summaries in Italian, p. 484, French, p. 488, and English, p. 492.) [Recd. July 1927.]

In 1926 the study of the relation between agrarian reclamation work and endemic malaria in the Ferrara district was limited to three localities ; one drained and almost free from malaria though Anophelines are numerous, the second less successfully drained and still malarious, and the third not yet drained and very malarious. In these localities *A. maculipennis*, Mg., *A. sacharovi*, Favr, and *A. hyrcanus* var. *pseudopictus*, Gr., occur, the first two being of importance. *A. bifurcatus*, L., was observed in the spring of 1927. No confirmation was obtained of the view that *A. sacharovi* is favoured by a greater salinity in the water. It seems to have a greater preference for human dwellings than *A. maculipennis*, and one of the authors, G. Brotzu, considers it to be a more dangerous vector of malaria than the latter. Its distribution in these localities appears to correspond to some extent with that of the disease. Some mosquito measurements, made by D. Brighenti, seem to show that the Anophelines, particularly *A. maculipennis*, tend to be larger in the malarious localities, smaller ones being found in the one where malaria is very scanty. There does not appear to be a relation between the density of the Anophelines and malaria. Dissections show that the mosquitos in the locality almost free from malaria remain capable of biting man. As regards the importance of houses in the propagation of the disease, the experiments seem to prove that mosquitos leave a room where they have fed rather quickly, *A. sacharovi* remaining longer than *A. maculipennis*. According to Dr. L. Robuschi, the few mosquitos taken in stables included more individuals that had bitten man than were found among the many taken in dwellings.

Falleroni (D.). **Per la soluzione del problema malarico italiano.** [The Solution of the Malaria Problem in Italy.]—*Riv. Malariologia*, vi, no. 2, pp. 344–409. Rome, March-April 1927. (With Summaries in Italian, p. 485, French, p. 489, and English, p. 493.) [Recd. July 1927.]

A study of the regression of malaria in Italy, which is correlated with the development of agriculture and has not been accompanied by the

disappearance of Anophelines, leads the author to accept the conclusions of Roubaud and Wesenberg-Lund that stabled domestic animals exercise a protective effect. This fact was discovered by Dr. Bonservizi, who as early as 1903 and 1905, published definite statements that domestic animals afforded a protection and gave instances of it.

The author's observations on the biology of Anophelines do not agree with those of Roubaud and Wesenberg-Lund. In Italy *Anopheles maculipennis*, Mg., is domestic, both in malarious districts and in those that have been rendered healthy. The regression of malaria is, therefore, not due, as suggested by Wesenberg-Lund, to the mosquito having changed from an open-air species since the stabling of animals. *A. maculipennis* seeks shelters where it can feed and rest during the greater part of the day ; if stables abound and are attractive by reason of their position, the mosquito invades them and neglects dwellings ; under other conditions the latter are invaded. *A. maculipennis* transmits malaria, because it is a domestic species, while *A. hyrcanus* var. *pseudopictus*, Gr., does not do so because it is an open air one. In Italy *A. maculipennis* does not feed daily, even if it has opportunity of doing so, and its eggs mature even after a single blood meal. Abundance of food simply increases the number of eggs in each oviposition. In the Pontine marshes *A. maculipennis* bites man and animals indifferently. The physiological zootrophic race found by Roubaud has not been observed by the author. The protection afforded by animals is the only means of rendering malarial regions healthy. For this purpose, animal quarters should not be kept too clean and must be separated from the dwelling and situated between it and the mosquito breeding-place.

In Italy there are seven species of Anophelines capable of transmitting malaria : *A. maculipennis* with its varieties *messeae*, Falleroni, and *labranchiae*, Falleroni ; *A. sacharovi*, Favr (*elutus*, Edw.), with the same biology as *A. maculipennis* ; *A. hyrcanus* var. *pseudopictus*, which is the commonest mosquito after *A. maculipennis*, but lives in the open and can be avoided by stabling animals between the dwelling and its breeding-place ; *A. bifurcatus*, L., which is a sylvan species feeding chiefly on cattle ; *A. plumbeus*, Hal., and *A. algeriensis*, Theo., which are very scarce in Italy ; and *A. superpictus*, Gr., which is not widespread. Of these *A. maculipennis* is the only species requiring attention.

FERRÁN (J.). **Tentativas de inmunización contra el paludismo mediante una vacuna anti-anofélica.** [Attempts in Immunisation against Malaria by Means of an anti-Anopheline Vaccine.]—*Riv. Malariologia*, vi, no. 2, pp. 410–413. Rome, March–April 1927. (With Summaries in Italian, p. 486, French, p. 490, and English, p. 494.) [Recd. July 1927.]

In this preliminary paper it is suggested that vaccines may render man repellent to Anophelines and thus prevent malarial infection, or may render it possible for man to acquire an immunity from the disease, which does not affect the mosquito vectors. The author finds that injections of crushed Anophelines as antigens are innocuous. After five injections, each of the material from five mosquitos, anti-bodies occurred in the blood that seemed able to neutralise the action of the poison that is believed to be responsible for the inflammation caused by the bite.

CASTIGLIONI (A.). **Italy's Campaign against Malaria.**—*Brit. Med. Jl.*, no. 3475, pp. 278–279. London, 13th August 1927.

Measures against malaria in Italy include gratuitous distribution of quinine in malarial zones and the draining of marsh-lands and increasing agricultural cultivation in these parts. To destroy Anopheline larvae stagnant pools are treated with petroleum or heavy oil, and the fish, *Gambusia affinis*, is introduced where malaria is prevalent. Cattle are bred in the malarial districts, in order to prevent the infection of the mosquitos. In certain areas the Anophelines no longer attack man, and in other places they only do so from the spring until July. In the regions where rice is cultivated Anophelines are very abundant.

The Use of American Fish to fight Italian Mosquitos.—*Science*, lxvi, no. 1701, suppmt., p. xii. New York, N.Y., 5th August 1927.

Large numbers of *Gambusia* have been introduced from America into Italy to destroy mosquito larvae. This fish appears to flourish in all the malarial regions of Italy from Istria to Sicily, even better than in its native land. It does well in small ponds or large lakes and in fresh or slightly salt water, It can resist high temperatures and other unfavourable conditions and survive in the smallest residuary puddles after all the native fish have perished.

S[OWERBY] (A. de C.). **Fighting Mosquitos with Fish.**—*China Jl.*, vii, no. 2, p. 104, 1 pl. Shanghai, August 1927.

Polyacanthis opercularis (paradise fish) occurs in the rivers and creeks round Shanghai and readily devours the larvae of mosquitos, but not being a rapid breeder, it is unlikely to be of great value for mosquito eradication. The top-minnow, *Gambusia affinis*, is extremely useful, and it is proposed to start a hatchery for the breeding of these fish where they can be protected from the cold, which destroyed most of those imported from Manila. A fish that closely resembles a top-minnow and occurs in large numbers in Kiangsu may also prove of value.

MELENEY (H. E.). **The Types of Breeding Place used by *Anopheles hyrcanus* in North and Central China.**—*China Med. Jl.*, xli, no. 4, pp. 347–350, 2 refs. Shanghai, April 1927.

Anopheles hyrcanus var. *sinensis*, Wied., is probably the chief carrier of malaria among the three Anophelines found in North and Central China [*R.A.E.*, B, xiv, 142]. The larvae of this mosquito were found in still, clear water containing plants that partly covered the surface, those most constantly present being *Spirogyra* (an important source of food) and *Ceratophyllum*, both of which provide mechanical protection from fish. Ponds ranging from 1 to 100 yards in diameter contained the greatest number of larvae, old weed-grown clay-pits in brickworks being particularly favourable to their development. Canals, except where disused and choked with grass, were not found to contain larvae, though they were occasionally observed in running streams where the current was slow, if water-plants were present. In the absence of certain types of small fish that devour the larvae, mosquito breeding can take place without the presence of water-plants, certain of which,

such as *Lemna*, tend to cover the entire surface of a body of water and thus inhibit the development of the larvae by preventing them from reaching the surface to breathe. It was observed that in rice-fields where the crop was still standing larvae were usually only found where water-plants were abundant. Contrary to the general belief, breeding never takes place in China in water receptacles, except where water has been stagnant so long as to admit of the growth of *Spirogyra*.

Control measures advocated include the filling in or draining of ponds likely to provide breeding-places, and where this is impossible the use of Paris green as a larvicide [*R.A.E.*, B, xiv, 17], the removal of surface water-grass and flotage, and stocking ponds with fish known to be efficient in destroying the larvae. The frequency of application of Paris green depends on the rate of development of the larvae in any locality, one application in every ten days being considered a safe interval for North and Central China.

[Christophers (S. R.).] **Instructions for Collecting and Forwarding Specimens in Connection with the Investigation of Mosquitoes and Malaria in India.**—*Govt. India Central Pubn. Br.*, [Health Bull. 8 (Malaria Bur. no. 1)] 27 pp., 1 pl. Calcutta, 1924. [Recd. June 1927.]

In the first part of this paper instructions are given for the collection of adults, pupae and larvae of *Aëdes* (*Stegomyia*), *Culex* and *Anopheles*; for the rearing of pupae and larvae, and for the killing, mounting and forwarding of specimens.

Knowles (R.) & Senior-White (R.). **Malaria: Its Investigation and Control with Special Reference to Indian Conditions.**—8vo, vii + 220 pp., 6 pls., 71 figs., 12 pp. refs. Calcutta, Thacker, Spink & Co., 1927. Price *Rs.* 7/8.

The information contained in this book is in outline somewhat similar to that in one recently noticed [*R.A.E.*, B, xv, 79], but is of a less elementary nature and is designed rather for the help of those desiring to carry out a malaria survey (particularly in India); it contains an account of the malaria parasites and practical instructions for the diagnosis of malaria in the laboratory, the treatment of patients, and the search for mosquitos in the field, with chapters on malaria survey work, the design and maintenance of anti-mosquito measures, etc. In appendices are given notes on the breeding-places and distribution of Indian Anophelines, with keys to adults and mature larvae of the genus *Anopheles* in the Indian sub-region. A good deal of the matter is taken from the published works of other authors, a lengthy bibliography being appended.

Strickland (C.) & Choudhury (K. L.). **The Anopheline Larvae of India, Ceylon and Malaya.**—8vo, 67 pp., 12 pls., 41 refs. Calcutta & Simla, Thacker, Spink & Co., 1927. Price *Rs.* 4/8.

This book is a sequel to a previous work on the adults [*R.A.E.*, B, xiv, 150] and includes a key for the identification of the Anopheline larvae known in India, Ceylon and the Malayan region (west of

Wallace's line), with a chapter on the collection of larvae. Information contained in appendices includes notes on catching adults, the recorded geographical distribution of the species, and observations on the commoner habitats of the larvae.

SENIOR-WHITE (R.). **Notes on Ceylon Mosquitoes, II.—The Larvae of the commoner non-Anopheline Mosquitoes.**—*Spolia Zeylanica*, xiv, pt. 1, pp. 61–73, 6 pls., 14 refs. Colombo, 30th April 1927.

A list is given of the Culicine mosquitos of Ceylon, some of which are additional to those enumerated by Edwards [*R.A.E.*, B, x, 230]. Keys to the larvae are given for 18 of the 27 genera and 37 of the 69 species. Notes, partly based on personal observations and partly on those of other authors, on the larvae of 22 species are also given.

SENIOR-WHITE (R.). **Notes on Oriental Species of the Genus** *Sarcophaga*.—*Spolia Zeylanica*, xiv, pt. 1, pp. 77–83, 1 fig., 1 ref. Colombo, 30th April 1927.

Experiments on the succession of species of *Sarcophaga* in decaying snail material carried out in Ceylon showed that *Sarcophaga dux dux*, Thoms., was invariably the first to find the material and was able to breed in it at all stages of decomposition. It was followed in dry weather by *S. kempi*, S.W. ; in wet weather *S. fuscicauda*, Bött., took second place, and *S. dux harpax*, Pand., also occurred. The large species, *S. annandalei*, S.W., and *S. orientaloides*, S.W., are not constant visitors to this material. Fresh faeces produced abundant material of *S. knabi*, Park., but older material was entirely without attraction for any species of *Sarcophaga*. These experiments thus only revealed 7 of the 14 species and sub-species found in the district.

S. ruficornis, F., and *S. hirtipes orchidea*, Bött., can be artificially reared on snail material, and of the remaining five, none of which has ever been bred in Ceylon, *S. albiceps*, Mg., has been reared elsewhere from human excrement, from dead rabbit and as a possible parasite on *Nonagria* ; *S. martellata*, S.W., which is very rare in Ceylon, has been bred elsewhere from night-soil trenches, while *S. pusana*, S.W., and *S. antilope*, Bött., have never been bred.

An attempt to discover the effect of seasonal fluctuations on species prevalence by catches made at fortnightly intervals over a period of 3 months showed that *S. fuscicauda* is absent unless there has been much rain, whereas the reverse is the case with *S. kempi*. *S. hirtipes orchidea* is also associated with rainy conditions, whilst *S. dux dux* and *S. orientaloides* are more numerous in dry weather. *S. knabi* is only present as wind-blown specimens, and *S. albiceps* is only represented by stragglers. A new subspecies, *Sarcophaga dux scopariiformis*, discovered in the course of these observations, and *S. pusana*, individuals of which were also taken, and which has only hitherto been known from the unique type from Pusa, 2,000 miles further north, are described. A table is given showing the results of some dissections made to discover the extent to which *Herpetomonas sarcophagae* is prevalent. Of the 8 species represented by 27 specimens dissected, the parasite occurred in 6, but only *S. orchidea* was heavily infected.

[Oganov (A. I.).] **Оганов (А. И.). Report of the Work of the Kosminsk Malaria Station of the Kostrom Government during the Season of 1926.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, v, no. 2, pp. 86–94. Moscow, 1927.

During 1926 a campaign against malaria was carried out in co-operation with the local turf-pit works. The characters of the various turf-pits are described. The only Anopheline taken was *Anopheles maculipennis*, Mg., which occurred in very small numbers as compared with *Culex*. The general prophylactic measures included oiling of breeding-places and the distribution of quinine. The number of malaria cases among the workmen has been greatly reduced during the past four years, an infection rate of only 4·6 per cent. being recorded for 1926 as compared with 29 per cent. in 1923.

[Pokrovskaya (M.), Dobrova (M.) & Zinkovskiĭ (D.).] **Покровская (М.), Доброва (М.) и Зинковский (Д.). The Work of the Travelling Malaria Unit of the Ryazansk-Uralsk Railway.** [*In Russian.*] —*Russ. Jl. Trop. Med.*, v, no. 2, pp. 94–104, 5 figs., 1 ref. Moscow, 1927.

During 1924 and 1925 a detailed survey was made of 48 areas in the Transvolga region of the Ryazansk-Uralsk Railway. The various types of water and their relation to mosquito breeding are described. There are large numbers of natural and artificial ponds, which produce the following fauna during the summer season: *Anopheles maculipennis*, Mg., 80 per cent.; *Culex* (mainly *C. modestus*, Fic.), 10 per cent.; *Aëdes* (mostly *A. dorsalis*, Mg.), 8 per cent.; and *Chironomus* sp., 2 per cent. The most important breeding-places as regards malaria in the steppes, however, are the steppe rivers. These rivers do not carry much water except in the spring when the snows melt, and as they are the only source of water for household and irrigation purposes in the many small villages along their banks, they are dammed and thus form a number of large flat stretches of water. As the water level drops, the river disappears, and swamps are produced that give rise to conditions greatly favouring the increase of swamp vegetation and mosquito breeding.

The local distribution of the various forms of malaria is discussed.

[Simanin (P. I.).] **Симанин (П. И.). The artificial infection of *Anopheles maculipennis*, Mg., with *Plasmodium praecox* and *P. vivax*.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, v, no. 3, pp. 142–150, and suppmt. 1 p., 7 figs. Moscow, 1927. (With a Summary in French.)

Anopheles maculipennis, Mg., was found during the winter in living-rooms with a temperature of 18–20°C. [64·4–68°F.], having apparently come from cellars. Feeding experiments were therefore carried out with 600 individuals removed from their hibernating quarters in the cellars and placed in small muslin cages. The lowest temperature at which a blood meal was taken was 3°C. [37·4°F], the most suitable temperature being 22–26°C. [71·6–78·8°F.]. The mosquitos were given a small quantity of water, but no food other than blood. They sometimes oviposited several times and lived long enough at about 22°C. to enable the malarial parasites (*Plasmodium vivax* and *P. praecox*) to develop to an infective stage.

[Raevskiĭ (G. E.).] **Раевский (Г. Е.). On the Biology of *Anopheles maculipennis*, Mg., and its Control in the Suizran District (1925–26).** [*In Russian.*]—*Russ. Jl. Trop. Med.*, v, no. 3, pp. 150–154, 3 refs. Moscow, 1927.

The seasonal history of *Anopheles maculipennis*, Mg., as observed in 1925 and 1926 in the Suizran district of the Volga region is described. Though as a rule the hibernating quarters are mostly chosen below ground level, 54 per cent. of those found in 1925 were above ground, many being in dwellings.

The only organised measure carried out against the hibernating mosquitos was collection by hand. Fumigation was not practicable as the local dwellings are not airtight. It was found, however, that if the room was filled with a sufficient amount of smoke, the mosquitos would fly to any light. All openings except the doors were therefore covered, and a mosquito net hung over the latter, on which the mosquitos collected and were destroyed. In practice this method was only effective when there was a certain degree of warmth; during cold weather when hibernation is complete the mosquitos merely fall to the ground and eventually recover.

Examination of mosquitos taken in dwellings showed 1·06 per cent. to be infected with malarial parasites in 1924; in 1925 only 0·2 per cent. were infected, while a careful examination in 1926 showed no infection.

[Smorodintzev (I. A.) & Ravich-Shcherbo (M. I.).] **Смородинцев (И. А.) и Равич-Щербо (М. И.). The Relation between the Mineral and Organic Contents of Turf-pit Waters and the Occurrence of *Anopheles* Larvae in them.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, v, no. 3, pp. 155–161, 1 fig., 3 refs. Moscow, 1927.

The work in connection with the composition of turf-pits and its relative bearing on the presence of larvae of *Anopheles* has been extended [*R.A.E.*, B, xiv, 201]. Samples of water taken from various sphagnum and sedge peat bogs, both new and old, near Moscow, have been analysed, and the results are shown in tables. Though it is not yet known what composition favours or prevents Anopheline breeding, it is evident that the organic constituents of the sphagnum waters with a pH of less than 5 are injurious to the larvae. A preponderance of the organic over the mineral constituents of the sphagnum waters is not suitable for the life of *Anopheles*, but with an abundance of organic constituents not of sphagnum origin and a pH of 7·43 the larvae develop well.

It is concluded that the important factor influencing the development of the larvae is not the actual amount of organic constituents, but rather the preponderance of mineral over organic matter and the presence of some specific constituents, the scarcity or absence of which impedes the development of vegetation and makes the medium unsuitable for the larvae.

Marshall (J. F.). **Principles and Practice of Mosquito Control.**—38 pp., 53 figs. Hayling Island, British Mosquito Control Inst., 1927. Price 2*s.* 6*d.*

This handbook of the British Mosquito Control Institute, which was opened in 1925, describes the work of mosquito control on Hayling

Island initiated in 1920, as a result of which the mosquito nuisance has been entirely abolished in the Island. Most of the information has been noticed in previous papers [*R.A.E.*, B, xiii, 187, etc.]. Notes are included on the wing venation of mosquitos, the classification of the British species, the use of oils and larvicides, etc.

LESTER (A. R.). **The Coconut Palm. Its Potentialities in providing Breeding Places for Mosquitoes.**—*Jl. Trop. Med. & Hyg.*, xxx, no. 11, pp. 136–145, 1 pl., 5 refs. London, 1st June 1927.

Observations are recorded on coconut palms in Tanganyika Territory and Kenya Colony, and for a brief period in Bombay. The technique of making the observations and the arrangement of the leaves of coconuts are fully described. While no water lodges in the hollows of the basal leaves under natural conditions for more than an hour, fluid probably consisting of dew or rain is known to be retained in the crown of the palm, though it has hitherto been observed only at the bases of the intermediate leaves, which are more closely attached than the basal type to the circumference of the stem by fibrous bracts forming a crescent-shaped cavity often containing damp débris. The amount of fluid collected from these sources varied from a few drops to 56 cc. from a single leaf. The fluid is found more frequently after rain and can be retained for at least 21 days, possibly longer.

No mosquito larvae were obtained from the palms in any of the observations, and reasons are given for considering it possible that the native who collected larvae for Haworth [*R.A.E.*, B, xiii, 39] did not, in fact, obtain them from palm trees. Larvae introduced into cavities at the bases of leaves were immediately consumed by ants. In breeding experiments with late instar larvae of *Anopheles*, *Culex* and *Aëdes* (*Stegomyia*), over 95 per cent. survived in test tubes containing water from their breeding-places, a uniform slight reduction in the proportion of survivals occurring in tubes containing rain water and fluid taken from intermediate leaves diluted with an equal amount of such water, and all larvae dying in tubes containing a similar dilution of water from young coconuts or sap. Attempts to breed the early instar larvae of *Anopheles* failed in every case, though the other two genera proved hardier under laboratory conditions. Experiments with smaller proportions of water from the breeding-places all failed, the larvae in all tubes except the undiluted originals dying quickly.

As the result of these observations, the author considers that the presence of coconut palms as presenting a source of breeding for mosquitos is not prejudicial to the health of a community living in their vicinity ; further observations are therefore required before drastic measures are taken with such palms.

DAVIS (N. C.). *Anopheles pseudopunctipennis* **as a Malaria Transmitter in Northern Argentine Republic.**—*Amer. Jl. Trop. Med.*, vii, no. 3, pp. 167–176, 3 figs., 6 refs. Baltimore, Md., May 1927.

Anopheline mosquitos encountered in the course of studies carried out from September 1925 onwards in the Province of Tucumán, Argentina, were *Anopheles pseudopunctipennis*, Theo., *A. albitarsis*, Arrib., *A. argyritarsis*, R.-D., and a variety of *A. tarsimaculatus*, Goeldi ; the author uses these names throughout the paper, although

he points out that the species referred to as *A. argyritarsis* and *A. tarsimaculatus* have been described by Brèthes [*R.A.E.*, B, xiv, 197] as *A. rooti* and *A. evansi*, respectively. Routine captures in three towns throughout the summer of 1926 showed that *A. pseudopunctipennis* is the most prevalent of the four species, its greatest abundance immediately preceding the highest point of the malaria epidemic in the middle of April. Of Anophelines captured in houses 99 per cent. were this species, and 2·8 per cent. of 435 specimens dissected contained malaria parasites. While *A. pseudopunctipennis* has previously been known to transmit malaria in Panama and California, it has never been considered important in these regions. In Argentina, however, it has long been recognised as the most dangerous malaria carrier in the northern provinces, and the author believes it to be the sole vector of the disease in the regions studied, though *A. argyritarsis* and *A. albitarsis* were relatively more prevalent during the non-malarial seasons, the latter exhibiting a highly developed preference for animal blood. Although the numbers of *A. tarsimaculatus* increased as those of *A. pseudopunctipennis* waned, the former species was never found in any appreciable numbers in dwellings, and its maximum production occurred in the second half of April and the first half of May, after the malaria epidemic season had passed its highest point.

A. pseudopunctipennis is most prolific in unshaded, running water, such as drainage ditches and creeks, breeding in large numbers in rivers during the warm weather in November and December, before the heavy rains, and continuing to a smaller extent in backwaters where a water plant, *Jussieua repens*, which becomes matted with algae, provides shelter. Springs and seepage water also provided important breeding-places, and although green algae were usually present where larvae occurred, a few were found in water containing very little vegetation. Very few larvae were found in stagnant pools covered with plants such as *Pistia*, *Azolla* and *Lemna*, in marshes or in irrigation ditches. No larvae were found in artificial containers or curbed wells. The most dangerous breeding-places were all within a radius of about 1,000 yds. from the towns.

Hearle (E.). **A new Canadian Mosquito (Culicidae).**—*Canad. Ent.*, lix, no. 5, pp. 101–103. Orillia, Ont., May 1927.

Aëdes pacificensis, sp. n., is described from a series of both sexes from Discovery Island, British Columbia.

Twinn (C. R.). **Notes on the Mosquito Fauna of Quebec.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925–26*, pp. 84–92, 6 refs. Quebec, 1926. [Recd. June 1927.]

Of the 24 mosquitos here recorded from Quebec, 13 belong to the genus *Aëdes*, including the troublesome species, *A. canadensis*, Theo., and *A. hirsuteron*, Theo. Only two species of *Anopheles* occur, *A. punctipennis*, Say, and *A. maculipennis*, Mg., both of which are comparatively rare. *Taeniorhynchus perturbans*, Wlk., is the only representative of this genus; it is a persistent and vicious biter and frequently enters dwellings. Brief notes are given on the seasonal occurrence and distribution of all the species dealt with, and their breeding-places are discussed.

Maheux (G.). **Household Insects.**—*18th Ann. Rept. Quebec Soc. Prot. Plants, 1925–26*, pp. 96–112. Quebec, 1926. [Recd. June 1927.]

This popular account includes mosquitos, fleas, *Musca domestica* and other flies and lice (*Pediculus*), as well as the more common household pests. Remedial and preventive measures are discussed, and the methods of using sulphur dioxide, carbon bisulphide and hydrocyanic acid gas as fumigants are described.

Martini (E.). **Ueber zwei neue Stechmückenarten aus Anatolien.** [Two new Mosquitos from Anatolia.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 8, pp. 386–390, 4 figs. Leipzig, August 1927.

Aëdes subtrichurus, sp. n., described from both sexes, and *A. nigricans*, sp. n., from a single male are recorded from Anatolia.

Nieschulz (O.). **Overbrengingsproeven mit** *Tabanus rubidus*, **Wied., *T. striatus*, Fabr., en** *Stomoxys calcitrans*, **L.** [Transmission Experiments with *T. rubidus*, *T. striatus* and *S. calcitrans*.]—*Dept. Landbouw, Veeartsenijk. Meded.*, no. 55. [Buitenzorg] 1926. (Abstract in *Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 8, p. 392. Leipzig, August 1927.)

Experiments, in most of which several flies were employed, were made at Buitenzorg with the object of infecting horses [with surra] by means of *Tabanus rubidus*, Wied., and *T. striatus*, F., which are the chief Tabanids in Java, and *Stomoxys calcitrans*, L. *T. rubidus* conveyed the infection from horses in three experiments out of eight, and from buffalo in one out of three. *T. striatus* conveyed the infection from horses in two out of five cases ; an attempt to transmit infection from a buffalo failed. The experiments with *S. calcitrans* proved negative.

Nieschulz (O.). **Over de ontwikkeling van** *Tabanus striatus* **Fabr.** [On the Development of *T. striatus*.]—*Dept. Landbouw, Veeartsenijk. Meded.*, no. 56. [Buitenzorg] 1926. (Abstract in *Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 8, pp. 391–392. Leipzig, August 1927.)

Tabanus striatus, F., is one of the most important vectors of surra in the Dutch East Indies. The eggs are laid in batches of 193–418 on rice leaves and are often parasitised by an undescribed species of *Phanurus*. The young larvae live in the mud in rice-fields, the older ones in the earth of the banks. There are seven larval instars, the first moult occurring an hour after hatching. The seventh instar, which is chiefly one of rest, may last from 14 to 159 days. Most of the larvae, however, pupate in less than eight weeks. The larvae are difficult to distinguish from those of *T. rubidus*, Wied., but when mature are smaller. The pupal stage lasts 8–12 days. The sexes are about equally represented.

Nieschulz (O.). **Over Tabaniden-broedplaatsen op Java en Sumatra.** [Tabanid Breeding-places in Java and Sumatra.]—*Dept. Landbouw, Veeartsenijk. Meded.*, no. 58. [Buitenzorg] 1926. (Abstract in *Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 8, pp. 392–393. Leipzig, August 1927.)

The commonest Tabanid in Java and Sumatra is *Tabanus rubidus*, Wied. ; 50 per cent. of the adults bred belonged to this species, and it occurred in three-quarters of the breeding-places. It appears to breed equally well in both running and stagnant waters in forests as well as in marshes, and even in brackish water. *T. striatus*, F., which is the next most abundant, also appears adapted to all conditions, open country being preferred. *T. rufiventris*, F., prefers streams in forests, and *Chrysops dispar*, F., fish-ponds, where it is the predominant species ; it may also occur in pools and streams in open and forest lands. The ubiquity of the commonest species and the difficulty of combating them with chemicals owing to their habit of living hidden in the mud, make the possibility of dealing with them very doubtful.

Schuurmans Stekhoven, jr. (J. H.). **De bloedzuigende Arthropoda van Nederlandsch Oost-Indië. viii. Tabaniden en surra in het Veeteelt Ressort Padang Sidempoean.** [Tabanids and Surra in the Cattle-raising District of Padang Sidempoean.]—*Tijdschr. Ent.*, lxx, no. 1, pp. 1–36, 1 map, 5 refs. Amsterdam, August 1927.

Many years' study will be necessary to acquire a full knowledge of the biology of Tabanids and to become acquainted with the factors that give rise to epidemics of surra. The topography of the district under consideration, which is on the west coast of Sumatra and is particularly suited for such an investigation is described in detail, and the local occurrence of the various Tabanids in it is discussed. Of a total of twenty-two species that occur there, those that merit close study are *Tabanus immanis*, Wied., *T. rubidus*, Wied., *T. striatus*, F., *T. minimus*, Wulp, *T. ceylonicus* Schin., and *Haematopota javana*, Wied. The data obtained indicate that *T. rubidus*, *T. striatus* and *H. javana* may have two or three generations a year.

Enderlein (G.). **Die von Holtz in Griechenland gesammelten Tabaniden.** [Tabanids collected by Holtz in Greece.]—*Stett. ent. Ztg.*, lxxxviii, no. 1, pp. 99–101, 2 refs. Stettin, July 1927.

This collection of Tabanids from Greece includes *Tabanus* (*Therioplectes*) *holtzianus*, sp. n.

Walker (G. P.). **A Blackfly** (*Simulium bracteatum*) **fatal to Goslings.**—*Canad. Ent.*, lix, no. 6, p. 123. Orillia, Ont., June 1927.

In certain areas of New Brunswick and Nova Scotia a considerable difficulty in raising June geese and ducks has existed for some time. During 1926 young goslings were found to be severely attacked by *Simulium aureum*, Fries (*bracteatum*, Coq.), at least 100 flies being found on each bird. Most of the birds died when about 3 weeks old, probably owing to the loss of blood. Ducks were also attacked.

O'Kane (W. C.). **Black Flies in New Hampshire.**—*New Hampshire Agric. Expt. Sta.*, Tech. Bull. 32, 24 pp., 8 figs., 7 refs. Durham, N.H., October 1926. [Recd. June 1927.]

In the mountainous parts of New Hampshire Simuliids often constitute a serious nuisance, causing much discomfort in health resorts, and in some localities work in the woods is not undertaken in summer because of them. Experiments in the control of the larvae by oiling streams, carried out over a number of years, have shown that those in running water may be killed by a miscible oil. Heavy insoluble oils proved ineffective. In order to secure a satisfactory kill, the concentration of oil in the water should be sufficient to give it an opaque, white appearance, and the amount of oil should be such that the passage of the cloudy water past any given point occupies at least 90 seconds. Lower concentrations, giving only a bluish tinge to the water, are ineffective. The right concentration can be maintained in an evenly flowing stream by the addition of small amounts of oil at various points in its course as the original strength becomes diluted. Treatment of 500 yards of a shallow stream 8–10 feet wide with 2 U.S. gals. oil was successful; in this case it took 3–5 minutes for the cloudy water to pass.

Fish are rather easily affected by the oil, and the margin between the minimum treatment that will control the larvae and the maximum that the fish can endure is narrow; for this reason only short sections of a stream should be treated on a given day, a sufficient interval for the clearing of the stream being allowed before the next application. The use of nets to prevent fish from swimming or floating down the stream in contact with the oil and to turn them back into fresh water is attended by several difficulties. If the water in a stream is at all high, the nets hold back leaves and débris and constitute dams so that they are liable to break. Unless a stream is swift and free from eddies and pools, there is a tendency for the oil to linger so that the water does not clear completely for a considerable time, and the nets, retaining the fish in the partly uncleared water, do more harm than good.

In the course of seven years Simuliid larvae were collected in New Hampshire between March and November from 88 streams of various types, at altitudes ranging from a few feet to 2,000 feet above sea level. Larvae of eight species were obtained, including two possibly new, the larvae and pupae of which are described and figured. The other six species were *Simulium venustum*, Say, which occurred in the largest number of collections, *S.* (*Prosimulium*) *hirtipes*, Fries [*cf. R.A.E.*, B, xiii, 57], which is second in importance, and prefers streams that have an abundant supply of cold water in the late autumn and spring, even if they dry up in the summer, *S. vittatum*, Zett., *S. meridionale*, Riley, *S. aureum*, Fries (*bracteatum*, Coq.) and *S. piscicidium*, Riley, the last two occurring only in a few collections. A considerable volume of biological and ecological data was accumulated and is recorded. In view of the fact that well-grown larvae of *S. venustum*, *S. hirtipes*, *S. vittatum* and *S. meridionale* were found before the end of May, while the adults do not appear until May or June, it is assumed that these species pass the winter in the larval stage; there is no doubt of this in the case of *S. hirtipes*, young larvae of which occur in considerable numbers in November; it is probable that the eggs of this species are laid in the spring, when the level of the water in the streams is dropping, and that they remain above the water level throughout the summer. A species of *Mermis* was found parasitising larvae of

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S. venustum, *S. hirtipes* and an unidentified species. It appears that adult Simuliids may fly considerable distances on still, hot days, especially when the sun is shining, as they have been found a mile or more from their breeding-places.

PARMAN (D. C.), BISHOPP (F. C.), LAAKE (E. W.), COOK (F. C.) & ROARK (R. C.). **Chemotropic Tests with the Screw-worm Fly.**—*U.S. Dept. Agric.*, Dept. Bull. 1472, 32 pp., 5 refs. Washington, D.C., March 1927.

The screw-worm fly, *Cochliomyia macellaria*, F., is the most destructive blow-fly throughout the south-western part of the United States, particularly where cattle, sheep and goats are kept on ranges, the average annual loss from this pest being estimated at about £800,000. When the flies are abundant, the slightest abrasion on the skin of an animal is likely to be attacked. In this bulletin the repellent or attractant actions of 353 compounds and mixtures are reported on [*cf. R.A.E.*, B, xiv, 165, etc.]. These have been tested against various flies, but their action on *C. macellaria* only is recorded. Their effect was tested by smearing 5 cc. of the liquids or 5 gm. of the solids over 4 oz. of fresh beef liver in a jar, exposed near a packing house or other spot where flies were abundant, and the results were calculated by the ratio of the number of flies visiting the treated jar over the number visiting an untreated one, 1,152 treated jars being used in all. Of all the materials tested, certain pine products, such as pine oil (both the destructively and steam distilled), crude turpentine, pine tar and pine-tar oil, were among the best. The last-named, owing to its cheapness, availability, non-toxicity and adhesiveness, is recommended as the most suitable to use upon wounds of domestic animals in order to protect them against the attacks of *C. macellaria*.

About 20 of the organic compounds tried diminished the normal attractiveness of beef liver bait by about 90 per cent. Four of these were naphthaline derivatives, and seven were various kinds of "tear gases." There is not sufficient information on the organic compounds to show clearly any consistent relation between chemical constitution and repellent value. Copper carbonate was the only inorganic compound that proved an effective repellent. Powdered pyrethrum and derris, both of which are valuable contact insecticides, are effective repellents. The practicability of using these various substances on livestock remains to be tested.

JOYEUX (C.) & KOBOZIEFF (N. I.). **Recherches sur l'*Hymenolepis microstoma* (Dujardin, 1845).**—*C.R. Soc. Biol.*, xcvii, no. 19, pp. 12–14. Paris, 17th June 1927.

This is a brief preliminary account of the development of the Cestode, *Hymenolepis microstoma*, which was observed in Paris in mice reared in the laboratory, and also in one of 50 mice from Southern Oran (Algeria). The authors proved experimentally that the life-cycle could be completed in the beetles, *Tenebrio molitor*, F., and *Geotrupes stercorosus*, Scriba (*sylvaticus*, Panz.).

PINTO (C.). *Crithidia spinigeri* **n. sp. parasito do apparelho digestivo de** *Spiniger domesticus* **(Hemiptero Reduviidae).**—*Bol. biol.*, no. 7, pp. 86–87, 1 pl. S. Paulo, 20th June 1927.

The Reduviid, *Spiniger domesticus*, observed infesting the walls of dwellings in Matto Grosso, Brazil, and preying on the cockroach, *Periplaneta americana*, has been found in the nymphal and adult stages to harbour a new species of *Crithidia* here described as *C. spinigeri*.

DE FARIA (J. G.) & CRUZ FILHO (O.). **Sobre a occurrencia de um estagio intracellular de desenvolvimento do** *Trypanosoma cruzi* **no** *Triatoma megista* **(Burm.).** [On the Occurrence of an intracellular Stage of Development of *T. cruzi* in *T. megista*.]—*Bol. Inst. brasil. Sci.*, iii, no. 1, pp. 375–379, 3 figs. Rio de Janeiro, 30th June 1927.

An intracellular developmental stage of *Trypanosoma cruzi* has been observed in specimens of the Reduviid, *Triatoma megista*, Burm.

GALLI-VALERIO (B.). **Notes de parasitologie et de technique parasitologique.**—*Centralbl. Bakt., Paras. u. Infekt.*, Ite Abt. Orig., ciii, no. 4–5, pp. 177–182, 1 fig. Jena, 5th August 1927.

Numbers of *Cimex* (*Acanthia*) *pipistrelli* that were present in the bat-infested attics of a house in the Canton of Vaud had never appeared in the dwelling-rooms until the bats were driven away, when they became a serious nuisance to the tenants.

[OLENEV (N. O.).] **Оленев (H.O.). On the Distribution of** *Argas persicus*, **Oken, in U.S.S.R.** [*In Russian.*]—*Veterinarnui Truzhenik*, ii, no. 12, pp. 13–14. Omsk, December 1926. [Recd. June 1927.]

A review of the distribution of *Argas persicus*, Oken, indicates that it is limited by climatic conditions. In America it occurs from the equator to 40°N. latitude and in Europe to 52°N. latitude. In Siberia the author has found it even farther north than 55°. Oviposition was not observed at temperatures of 14–18° C. [57·2–64·4° F.], but occurred after 5–16 days when the ticks were kept at temperatures of 24–28° C. [75·2–82·4° F.]. The ticks only develop at temperatures above 20° C. [68° F.]. Exposure to a high degree of humidity was found to kill them.

SERGENT (Ed.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). **Les piroplasmoses bovines. La "fièvre de la côte orientale" et la theilériose nord-africaine (étude expérimentale comparative).**—*Ann. Inst. Pasteur*, xli, no. 5, pp. 489–506, 3 figs., 5 refs. Paris, May 1927.

The authors consider that *Theileria dispar*, the causal agent of Mediterranean coast fever, and *T. parva*, which produces African coast fever, are distinct species, the decisive proof being the absence of cross-immunity between the two diseases. Experiments with ticks confirmed this, since larvae of *Rhipicephalus appendiculatus*, Neum. (the vector of African coast fever) fed on cattle infected with *T. dispar*, did not transmit Mediterranean coast fever, whereas larvae from the same source,

fed on cattle infected with *T. parva*, consistently transmitted African coast fever. The impossibility of transmitting African coast fever by blood inoculation can no longer be considered a differentiating character, since 3 out of 12 inoculation experiments gave positive results, the infection in these cases being very mild. The diseases are also compared from the point of view of clinical development and morphology of the causal organisms.

VOGEL (R.). *Echidnophaga gallinacea* (**Sarcopsyllide**) **als Parasit der Alexandrinerratte** (*Mus alexandrinus* **Geoffr.**). [*E. gallinacea* as a Parasite of *M. alexandrinus*.]—*Centralbl. Bakt., Paras. u. Infekt.*, IIte Abt., lxxi, no. 8–14, pp. 313–314, 2 refs. Jena, 1st August 1927.

A specimen of *Mus alexandrinus*, observed in Anatolia in May 1926, was found to harbour about twenty-five individuals (including males) of *Echidnophaga gallinacea*, Westw. This flea had apparently been introduced with *M. alexandrinus* from the south-eastern Mediterranean coast, probably Egypt.

Medical Report of the Hamilton Rice Seventh Expedition to the Amazon, in Conjunction with the Department of Tropical Medicine of Harvard University, 1924-1925.—*Contrib. Harvard Inst. Trop. Biol. & Med.*, no. iv, xvi+313 pp., 70 pls., 16 figs., num. refs. Cambridge, Mass., 1926. [Recd. October 1927.]

In part I of this report by R. P. Strong, G. C. Shattuck and R. E. Wheeler are included discussions of leishmaniasis, malaria, trypanosomiasis and spirochaetal infections as occurring in the Amazon region. The form of trypanosomiasis known as mal de caderas is essentially a disease of horses and mules, caused by infection with *Trypanosoma equinum*, and sometimes breaks out in severe epizootics. The capybara (*Hydrochoerus capybara*) is frequently attacked by this disease, and it has been stated that it acts as a reservoir from which infection is conveyed to equines by Tabanids, but the authors do not think that this is the case, as this animal does not normally come into close contact with horses, and Tabanids act largely as mechanical vectors of the trypanosome. The coati (*Nasua narica*) is also susceptible to infection with *T. equinum*. Other parasitic infections of animals are discussed, and a chapter is devoted to insects causing lesions in man as a result of their bites or stings.

In part II, J. Bequaert gives an account of the insect fauna and Arachnoidea of the Amazon region investigated during the period 11th July to 21st September 1924, with special reference to medical and economic entomology. From Manáos, 32 species of mosquitos are recorded, including *Anopheles tarsimaculatus*, Goeldi, *A. albimanus*, Wied., and *A. argyritarsis*, R.-D.; the most abundant mosquitos in the town in July and August were *Aëdes argenteus*, Poir. (*aegypti*, L.), *Culex coronator*, D. & K., and *C. fatigans*, Wied. (*quinquefasciatus*, Say), larvae of *C. fatigans* being found in almost every collection of stagnant water examined. *A. argenteus* is abundant in the towns and on ships, on board which it breeds freely in very small accumulations of water, along the Amazon and its larger effluents, but is absent from the woods.

A list is given of 73 species of Tabanids known from the states of Pará and Amazonas, compiled from published records and the author's own findings.

Part III includes a paper by J. Bequaert dealing with the Arthropod enemies of molluscs, a slightly shorter version of which has been noticed previously [*R.A.E.*, B, xiii, 174].

BUXTON (P. A.) & HOPKINS (G. H. E.). **Researches in Polynesia and Melanesia. Parts i-iv (Relating principally to Medical Entomology).** —*Lond. Sch. Hyg. & Trop. Med.*, Mem. Ser., no. 1, xi+260 pp., 12 pls., 43 figs., 5 pp. refs. London, July 1927.

This Memoir records investigations on medical entomology in Samoa, Tonga, the Ellice Group, and the New Hebrides, in 1924 and 1925. An account is given of the geography and physiography of the Islands with a brief review of their fauna and flora. Climatic conditions in Samoa are discussed and the Myriapoda, Arachnida and Insecta occurring, with particular reference to Samoa, are reviewed. Detailed studies of *Aëdes variegatus*, Dolesch., and of *A. argenteus*, Poir., have been made, some of which have been reported upon in earlier papers [*R.A.E.*, B, xiii, 48, 184 ; xiv, 38]. Their relation to their environment is discussed, and the factors that control oviposition and those that cause the eggs to hatch are explained.

The appendices comprise a study of malaria and filariasis in the New Hebrides ; a discussion by J. F. C. Haslam as to whether there is a general factor tending to cause eggs of *A. variegatus* in different experimental pots to hatch on certain days, and an investigation by M. Greenwood and E. M. Newbold on the distribution of hatching times of *A. variegatus*.

JAMES (S. P.). **Problems of Malaria Prophylaxis. Conclusions of the Malaria Commission of the League of Nations.**—*Brit. Med. Jl.*, no. 3477, pp. 340–344, 2 refs. London, 27th August 1927.

The following are among the conclusions stated by this Commission :— At the present time, in the vast majority of the malarious regions, measures should be limited to an endeavour to reduce the severity of the disease ; measures designed to accomplish more (particularly eradication) are not a wise proposition. It is not always necessary to deal with malaria by a method directly connected with mosquitos. Consideration of the suitability for local conditions of any method is essential, and it is better to perfect one or two selected methods and only employ others later if necessary. There appear to be only two direct methods, killing the parasite in man by treatment of the disease and killing it in infected mosquitos by systematic destruction of adult Anophelines in dwellings. The latter measure should be regarded as an important item in the sanitary education of the inhabitants of malarious areas.

Of all indirect methods most importance must be attached to general schemes that aim at improving economic and social conditions. While open ditches and canals for agricultural drainage are often more prolific breeding-places of Anophelines than were the original swamps, it is evident that where such drainage has been carried out and where, in consequence, the inhabitants settle permanently and have a better

standard of life, malaria tends to lose its importance to an extent that more than compensates for an increase in the abundance of Anophelines.

Separate chapters of the report deal with other problems of malaria prophylaxis, particularly the organisation necessary for the work, and different anti-malarial and anti-mosquito methods. It is suggested that each Government should establish a small central permanent organisation devoted to malaria research. In this connection the establishment is suggested in one or two malarious areas of each country of an observation station where routine epidemiological inquiries should be made at short intervals for several years.

MUEHLENS (P.), HOFFMANN (C. C.) & CASASUS (J. G.). **Algunas observaciones acerca del paludismo en Mexico.** [Some Observations on Malaria in Mexico.]—*Bol. Dept. Salubridad Publ.*, 1927, no. 2, pp. 28–50. Mexico, 1927.

An account is given of observations on the occurrence of mosquitos and malaria as observed in various places on or near the east coast of central Mexico in March and April 1927. The Anophelines recorded were : *Anopheles quadrimaculatus*, Say, *A. pseudopunctipennis*, Theo., *A. albimanus*, Wied., and *A. vestitipennis*, D. & K. Engorged females of *A. quadrimaculatus* were taken in houses on several occasions and of *A. albimanus* in one instance. *Aëdes argenteus*, Poir. (*fasciatus*, F.) occurred in one locality ; in another it had been successfully controlled.

HOWARD (L. O.). **Mosquito Work during the Year 1925.**—*Proc. 13th Ann. Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 6–18. New Brunswick, N.J., 1926. [Recd. June 1927.]

This paper is a valuable review of recent literature on mosquitos and their control, most of which was published during 1925 and has already been noticed in this *Review*.

HEADLEE (T. J.). **Substantial Accomplishment in New Jersey Mosquito Control.**—*Proc. 13th Ann. Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 20–27. New Brunswick, N.J., 1926. [Recd. June 1927.]

The author indicates the value of the systematic control of mosquitos by comparing the increase in taxable values of properties in protected and unprotected zones during a given period before and after organised control work was instituted.

LESLIE (J. B.). **Principles of Procedure in Mosquito Control on both Upland and Salt Marsh.**—*Proc. 13th Ann. Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 27–33. New Brunswick, N.J., 1926. [Recd. June 1927.]

The author discusses some of the principles that he considers fundamental in connection with systematic mosquito control in either upland or salt marsh areas. These include the thorough surveying of the area ; the construction of a certain proportion of permanent drainage each year with an approximate estimate of the cost of effective mosquito reduction measures ; the publicity of the scheme in order to obtain the financial support and co-operation of the public ; the carrying

out of inspection and oiling with greater vigilance once the permanent drainage plans are well developed; the keeping of accurate records and maps showing all drainage work done as a basis for future work; the maintenance of existing drainage (in which connection the reduction of maintenance costs by installing efficient sub-soil drainage is mentioned); and the adoption of an effective supplementary system of oiling. Owing to the low value of salt marsh areas it is more difficult to enlist the support of the public, but the mosquito commission should insist on the installation of adequate culverts and proper marginal ditches in all newly developed land. The economy of oiling salt marshes is still doubtful, and it seems preferable to perfect the drainage system so that a minimum amount of oiling is required.

RUDOLFS (W.). **Investigations of Mosquito Problems carried on at the N.J. Agricultural Experiment Stations during the past Year.**—*Proc. 13th Ann. Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 33–54, 6 refs. New Brunswick, N.J., 1926. [Recd. June 1927.]

Owing to the rapid disappearance of oil applied on a river polluted with sewage, experiments were carried out to determine which of the numerous bacterial and chemical constituents were responsible. The results verified the assumption of V. M. Gubin [*R.A.E.*, B, xii, 77] that the hydrocarbon-digesting organisms are mainly responsible, though bacteria attacking protein materials also seem to have an effect by producing hydrogen sulphide gas. Studies in the laboratory showed that there is a definite succession of groups of bacteria acting on the following groups of materials found in sewage. First, certain materials chiefly of a carbonaceous nature such as sugars, soluble starches, etc., are readily attacked, then nitrogenous materials (protein) and finally complex carbohydrates such as cellulose and fibrous matter. The latter are always present in any stream, pond or ditch, while the first two groups of materials are usually only present when the water is polluted. A stagnant ditch will develop soluble carbohydrates from complex materials. Instead of making bacterial examinations of all water suspected of being polluted or having soluble carbohydrates [*loc. cit.*], the better test would be to determine chemically the presence of such soluble substances. This can be done rapidly and is comparatively easy.

A large number of essential oils, single constituents of these essential oils that give them their odour or apparent toxic properties, and other substances that might prove suitable as repellents to adult mosquitos were studied. Thuja oil, cinnamic aldehyde, anisic aldehyde, bergamot oil, clove oil and pyrethrum extract were the most effective substances. When they were used alone, they afforded protection for $\frac{1}{2}$–$1\frac{1}{2}$ hrs., but when they were mixed with vaseline, cold cream or face powders, the protection lasted for 2–3 hrs. For making a repellent 4–6 parts of oil or extract is mixed with 96–94 parts of vaseline or cold cream, or a powder may be used by mixing in as much oil as it will absorb without causing the formation of a paste. Protection seems to be based primarily on the volatility of the oils or active substances in the materials. When the oils are mixed with vaseline, the volatility is retarded and consequently the protection lasts longer [*cf. R.A.E.*, B, xiv, 38].

Studies on the food of mosquito larvae [*R.A.E.*, B, xiv, 86] were continued. A number of sampling places were selected, and water taken from them at fortnightly intervals was chemically analysed and microscopically examined for the presence of living organisms. For comparison the author gives the data obtained from a typical woodland pool, where *Aëdes canadensis*, Theo., bred continuously, and another, where supposedly no breeding would take place (actually owing, apparently, to changes in the composition of the water the larvae of a non-biting mosquito, *Uranotaenia sapphirina*, O.S., were found during the latter part of August and those of *Culex pipiens*, L. and *Anopheles* sp. were taken on September 15th). These data seem to confirm the conclusion [*R.A.E.*, B, xiii, 25] that food-supply for larvae is the chief factor governing breeding, and that food-supply is determined by the chemical composition of the water. Examinations of the gut contents showed that larvae of *A. canadensis* live on the animals and plants as they occur in the water, some feeding mostly on algae, some mostly on protozoa, and others on a mixed diet including both protozoa and algae. The author criticises a paper by R. Senior-White [*R.A.E.*, B, xiv, 33] and gives instances to show that the tolerance of mosquito larvae to variations in hydrogen-ion concentration and dissolved oxygen and saline ammonia contents is greater than is suggested by him, and that their food requirements are much less specialised.

The author also discusses at length the exclusion of salt water from salt marsh meadows by means of dykes, the consequent washing away of the salt from the soil by the percolation of rain water, and its effect on the vegetation. Various means of keeping the salt content of the soil at the level necessary for the growth of the meadow grasses are suggested.

GIBSON (A.). **Anti-Mosquito Work in Canada.**—*Proc. 13th Ann. Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 54–59. New Brunswick, N.J., 1926. [Recd. June 1927.]

A brief account is given of the mosquito investigation and control work carried out by E. Hearle at Banff, Alberta [*R.A.E.*, B, xi, 139] during the years 1923–25. Abnormal spring floods and heavy rainfall in 1923 resulted in the development of large numbers of mosquito larvae. In the treated areas 80 per cent. were destroyed by oiling, which was carried out from the middle of April to the middle of July. The following species developed in the snow pools, *Aëdes cataphylla*, Dyar, *A. communis lazarensis*, Felt & Young, *A. punctor*, Kirby, *A. pullatus*, Coq., and *A. lutescens*, F. (*flavescens*, Müll.), most of the adults emerging in the latter part of May. Large areas were flooded in mid-June, and enormous numbers of larvae of *A. cataphylla*, *A. communis lazarensis* and *A. vexans*, Mg., were present. The adults began to emerge at the end of June and became very troublesome in mid-July. Oiling was carried out from 11th June until the middle of July, and more permanent measures, such as ditching, were also undertaken. Infestation in 1924 was less severe than in 1923; the snow pools dried up quickly and the flooding was not so extensive. Oiling was carried out from 1st May until mid-July, and it was estimated that 90–95 per cent. of the larvae were destroyed. In snow pools *A. communis lazarensis* was predominant in brush areas and *A. punctor* in semi-permanent sulphur swamps. Few mosquitos were seen on the wing during June and July, and these were chiefly *A. intrudens*, Dyar, *A. cataphylla*, *A. canadensis*,

Theo., and a few *A. dorsalis*, Mg., *A. vexans* and *A. nearcticus*, Dyar. *Gambusia affinis* was successfully imported from California in milk cans for establishment in permanent waters. Those liberated in a warm sulphur pool containing large numbers of *Theobaldia* (*Culiseta*) *incidens*, Thoms., devoured them all within a few days. In 1925, control work, which was taken over by C. G. Childe and consisted chiefly of oiling, was very successful. *Anopheles maculipennis*, Mg., which is normally rare in the district, was found in some numbers in 1925.

An account is also given of the mosquito surveys carried out by C. R. Twinn in the Ottawa district in 1924 and 1925 [*R.A.E.*, B, xiv, 126] and in the Montreal district in 1925. Owing to the general topography of Montreal, outbreaks of mosquitos only occur in one locality, which is situated on high ground above a swampy area, where *Culex pipiens*, L., breeds in great numbers in the dirty and probably polluted water. *Aëdes stimulans*, Wlk., was found to be numerous on a small well-wooded island in the St. Lawrence River.

HOFFMAN (F. L.). **Some Observations on the Malaria Problem.**—*Proc. 13th Ann. Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 59–68. New Brunswick, N.J., 1926. [Recd. June 1927.]

The author discusses the malaria problem in general, giving instances of malaria work in various parts of the world to show the economic value of mosquito extermination and malaria eradication as a basis for the economic prosperity of the regions affected.

[**Mosquito Control Work and Methods.**]—*Proc. 13th Mtg. New Jersey Mosquito Exterm. Assoc., Atlantic City, 1926*, pp. 68–122. New Brunswick, N.J., 1926. [Recd. June 1927.]

Reports are given on mosquito extermination work carried out in various parts of New Jersey and other localities in the United States. Other papers included are: "Airships [aeroplanes] for Mosquito Control," by S. F. Morse; "Looking Backward and Forward in Mosquito Control," by J. G. Lipman; "The Tide-carried Debris Problem," by F. A. Reiley; "Mosquito Dredging Machinery," by W. H. Randolph; "Methods of Meeting Changes in Shore Line as Affecting Mosquito Work," by H. D. Taylor; "Performance of Ditch Cleaning Machinery," by A. W. Kelley; "Underground Drainage of Salt Marsh Areas," by Lester Smith; "Importance of House to House Mosquito Work," by F. Wilkinson; "Planning the Mosquito Statement," by A. J. Tipping; and "Should Salt Marsh Areas Protected by Dikes be flooded in Non-breeding Seasons?" by S. Miller.

DAPPERT (A. F.) & CLARKE (J. L.). **Mosquito and Malaria Control in Illinois.**—*Trans. Illinois State Acad. Sci.*, xix, pp. 353–371, 1 fig. Springfield, Ill., 1926. [Recd. August 1927.]

This paper, which is to some extent a continuation of a previous one [*R.A.E.*, B, xv, 67], is intended to point out the progress of work against mosquitos and malaria in Illinois since 1922, and to present the information obtained from a recent rural malaria survey in the south of the state, indicating the seriousness of the problem yet

remaining. Though several mosquitos may occasionally transmit malaria, *Anopheles quadrimaculatus*, Say, is the principal vector, a fact that simplifies rural malaria control. It is confined largely to certain definite types of breeding-places, and Paris green treatment is probably the least expensive method of control. The disease is not evenly distributed throughout the area, but occurs in small foci, which must be taken into consideration when planning remedial measures. These foci probably represent local breeding-places of *A. quadrimaculatus*, especially in those areas where agricultural drainage has been carried out to a considerable extent. Small bodies of permanent or semi-permanent water may be left because the agricultural value of a particular area does not justify its permanent drainage ; such work may, however, be justified as a public health measure.

[Mess (A. A.).] **Mecc (A. A.). On the Distribution and Biology of *Anopheles bifurcatus* Mg.** [*In Russian.*]—*C. R. Acad. Sci. U.R.S.S.*, A, no. 14, pp. 225–227, 1 fig. Leningrad, 1927.

The most common mosquito in the vicinity of the Caucasian mineral springs is *Anopheles maculipennis*, Mg., though *A. bifurcatus*, L., also occurs. The larvae of the latter appear early in April, give place later to those of *Culex* and *A. maculipennis*, and reappear in August with larvae of *Theobaldia annulata*, Schr. Both this species and *A. bifurcatus* hibernate in the larval stage.

Jaarverslag der wetenschappelijke Malaria-commissie voor Noord-Holland over 1926. [Report for 1926 of the Scientific Malaria Commission for the Province of North Holland.]—35 pp., 19 refs. Amsterdam, Minist. Arbeid, Handel en Nijverheid, June 1927.

In 1926, during work against the larvae [of *Anopheles maculipennis*, Mg.], the determination of breeding-places prior to oiling was sometimes abandoned as too costly, economy in oil being obtained by oiling in stretches of five paces with intervals of ten paces. In dykes with a not too dense horizontal vegetation this gave a satisfactory film. Investigations with Paris green have already been noticed [*R.A.E.*, B, xv, 73, 102]. Studies on the morphology and biology of *A. maculipennis* were continued, specimens being obtained from all parts of Holland [*R.A.E.*, B, xv, 21, 145].

The destruction of adult mosquitos in dwellings was continued. The value of mosquito netting was proved by hospital records made from 1924 to 1926 ; of protected sleepers 3·36 per cent. became infected with malaria, of unprotected, 13·91 per cent. Screening was simplified by arranging that only bed-rooms should be screened, and furthermore only one window in each bed-room, which can be left open at night.

Herold (W.). **Der Stand der Mückenbekämpfung in den Bädern der Inseln Usedom and Wollin.** [The State of Anti-mosquito Work in the Seaside Resorts of the Islands of Usedom and Wollin.]—*Ent. Mitt.*, xvi, no. 5, pp. 380–382. Berlin, 1st September 1927.

Mosquitos are very troublesome in the seaside resorts of the Pomeranian islands of Usedom and Wollin. The species observed during eight years at Swinemünde included *Anopheles maculipennis*, Mg., *Culex pipiens*, L., *Theobaldia* (*Culiseta*) *annulata*, Schr., and *Aëdes*

spp., including *A. dorsalis*, Mg. The three first-named are occasionally troublesome, particularly in spring. *A. dorsalis* is the chief pest, its outbreaks being associated with the flooding of meadows on the Swine river by the piling up of water by northern and western winds, and the setting in of southern or south-eastern winds after the adults emerge. The permanent reclamation of the flood-lands is the only feasible measure.

CHEESMAN (L. E.). **Notice sur les moustiques de Tahiti.**—*Bull. Soc. Etudes océan.*, no. 19, pp. 245–247. Papeete, June 1927.

Brief notes are given on the breeding-places and biting habits of mosquitos observed in the Society and Marquesas Islands, the species dealt with being *Culex fatigans*, Wied., *Aëdes argenteus*, Poir., and *A.* (*Stegomyia*) *albopictus*, Skuse.

SENEVET (G.) & PRUNNELLE (M.). **A propos de la larve de** *Culex hortensis* **Ficalbi 1889.**—*Bull. Soc. Path. exot.*, xx, no. 5, pp. 419–422, 2 figs., 5 refs. Paris, 1927.

From an examination of larvae from which *Culex hortensis*, Fic., was bred in Algeria, and of the cast larval skins, the authors found that these agreed with the description given by Langeron for *C. hortensis* (*geniculatus*, Theo. nec Ol.) [*R.A.E.*, B, iv, 156] and not with that given by Séguy for this species, which apparently refers to *C. apicalis*, Adams.

BOREL (M.). **Résultats d'une enquête malariologique à Dalat (Cochinchine).**—*Bull. Soc. Path. exot.*, xx, no. 5, pp. 427–434. Paris, 1927.

Studies carried out at different times of the year in 1925 and 1926 at Dalat, South Annam, where there is an abundance of suitable breeding-places for mosquitos, show that although malaria is prevalent in all the valleys leading up to the Langbian plateau on which it is situated, there is no endemic malaria in the town itself. It is difficult to account for the absence of malaria, but the author thinks that it can probably be explained by Roubaud's theory [*R.A.E.*, B, viii, 141–144], and that the Anophelines have acquired a preference for domestic animals, which are numerous at Dalat.

No adult Anophelines were captured, but larvae of the following species were found in the course of these investigations: *Anopheles* (*Neomyzomyia*) *kochi*, Don., *A. aitkeni*, James, *A.* (*Neocellia*) *jamesi*, Theo., *A. hyrcanus* var. *sinensis*, Wied., *A.* (*N.*) *fuliginosus*, Giles, and *A.* (*N.*) *maculatus*, Theo., the last three being those found in permanent breeding-places. The water in these breeding-places, which are either natural or artificial pools, the latter resulting from excavation for brick-earth and other purposes, is shallow and contains abundant vegetation but no fish. Lakes with steep banks, deep water and no vegetation do not provide breeding-places.

Lopez-Neyra (C. R.). **Considérations sur le genre** *Dipylidium* **Leuckart.**—*Bull. Soc. Path. exot.*, xx, no. 5, pp. 434–440, 1 ref. Paris, 1927.

This is a revision of the Cestode genus *Dipylidium*, sens. lat. The only species known to complete its life-cycle in insects is *D. caninum*, which is found in dogs, cats and allied animals and also in man, the insect hosts being *Trichodectes canis*, Retz., *Ctenocephalus canis*, Curt., and *Pulex irritans*, L.

Mathis (C.), Durieux (C.) & Ewstifeief (C.). **Nouveau cas de fièvre récurrente contractée à Dakar.**—*Bull. Soc. Path. exot.*, xx, no. 5, pp. 441–445, 7 refs. Paris, 1927.

Only one case of relapsing fever certainly contracted locally has previously been reported at Dakar [*R.A.E.*, B, xv, 53], other cases occurring there having possibly originated elsewhere. A second case occurred in November 1926, the patient being a woman who had come from France six weeks previously. She stated that she had observed fleas in her bed-room soon after her arrival in Dakar. Grey mice were easily infected through a number of passages with spirochaetes found in the blood of this patient, which were consequently considered to resemble *Spirochaeta duttoni*, rather than *S. recurrentis* (*obermeieri*), which is transmitted only with difficulty to grey mice ; as, however, *Ornithodorus*, the vector of *S. duttoni*, is unknown at Dakar, it is thought probable that the spirochaete may be *S. crocidurae*, a parasite of the shrew [*Crocidura stampfli*] that can easily be transmitted to mice.

Experiments to discover the means of transmission from the shrew to man have not yet succeeded, but it is thought that the vector may be *Xenopsylla cheopis*, Roths., the only other ectoparasite of the shrew yet observed being *Echidnophaga* (*Sarcopsylla*) *gallinacea*, Westw., which is very abundant on small mammals at Dakar.

Narayan Rao (M. A.). *Piroplasma gibsoni* **Patton, 1910.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 785–800, 2 pls., 4 figs., 12 refs. Calcutta, April 1927.

Piroplasma gibsoni occurs in the blood of jackals and dogs in India and is apparently widely distributed in that country. The structure and development of the piroplasm in the animals and in cultures are described, and the clinical and pathological effects caused by it are discussed. An attack and recovery from the disease was found to give immunity from further infection. The disease may be transmitted from jackal to dog and *vice versa* by blood inoculation, but attempts to infect laboratory animals (rodents) by this means were unsuccessful. It is possible that the dogs hunting jackals might become infected through abrasions on the gums, but dogs that have never hunted are also sometimes infected.

Owing to the association of the tick, *Haemaphysalis bispinosa*, Neum., with the animals concerned [*cf. R.A.E.*, B, xv, 16], it is considered to be the most likely vector of *P. gibsoni*, and transmission experiments with it have therefore been made. The results cannot be considered conclusive ; they suggest, however, the possibility of *H. bispinosa* acting as vector of the disease. In one case nymphs obtained from

infected larvae were placed on a dog, and though the symptoms of a true case of *P. gibsoni* developed, the typical parasite was not seen in the blood. Subsequent tests, however, proved that the dog had developed immunity from the disease.

McCombie Young (T. C.) & Chalam (B. S.). **Two new Sandflies from Bombay.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 849–862, 1 pl., 5 refs. Calcutta, April 1927.

Phlebotomus chalami, sp. n., and *P. colabaensis*, sp. n., are described from Bombay, and compared with various other sandflies from India and Ceylon. The former may possibly be identical with *P. zeylanicus*, Annan., which has not yet been recorded from India.

Chalam (B. S.). **The Resistance of *Anopheles* Eggs to Desiccation.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 863–866. Calcutta, April 1927.

Observations on *Anopheles subpictus*, Grassi, and *A. stephensi*, List., the two commonest Anophelines in Bombay, have shown that their eggs can withstand desiccation up to a period of 12 days. When batches of eggs, varying from 80 to 100, were placed in mud collected from different sources and allowed to dry out naturally, the number of mosquitos reared from them decreased as the period of desiccation was increased. None of them hatched after 15 days.

It is thus possible that eggs left behind in the soil after a pool or drain has been emptied of water may hatch if rain or seepage occurs within a fortnight.

Chalam (B. S.). **The Possibilities of "Paris Green" as an *Anopheles* Larvicide.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 867–873, 2 figs., 1 pl., 4 refs. Calcutta, April 1927.

The use of Paris green (copper aceto-arsenite) for the destruction of mosquito larvae is discussed [*cf. R.A.E.*, B, xiv, 17], and recent experiments in India against the larvae of *Anopheles stephensi*, List., and *A. subpictus*, Grassi, are described. The arsenic content of the commercial product varies, but the author has obtained successful results with material containing 40 per cent. As_2O_3. One part of Paris green to 100 parts of any of the diluents mentioned [*loc. cit.*], applied at the rate of 15 grains of Paris green to every 10 square yards, proved satisfactory under all ordinary conditions. The period between applications should be shorter than that required for the larvae to develop to the pupal stage; once every 8 days is considered sufficient.

Strickland (C.). **Hypomelanism in an Anopheline.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 875–877, 2 figs., 4 refs. Calcutta, April 1927.

Several cases of hypomelanism in mosquitos are recorded from India, which all appear to be aberrations of *Anopheles vagus*, Dön. This lends support to the view that *A. immaculatus*, James, is merely an albino aberration of *A. vagus* [*R.A.E.*, B, ix, 133].

SINTON (J. A.). **Notes on some Indian Species of the Genus *Phlebotomus*. —Part xvi. Two Assamese "Sandflies" resembling *P. malabaricus*.—Part xvii. Further Records of the Geographical Distribution.—Part xviii. Miscellaneous Notes.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 933–939, 1 pl., 9 refs. ; pp. 941–945, 8 refs. ; pp. 947–953, 1 pl., 24 refs. Calcutta, April 1927.

Two female examples of *Phlebotomus* from Assam are described and compared with various known Indian species ; their characters agree only with those of *P. malabaricus*, Annan., and *P. zeylanicus*, Annan. The close resemblance between the females of these two species has been pointed out by previous authors, and in the absence of any knowledge of the male of *P. zeylanicus*, there is considerable doubt as to whether they are not identical.

Further records are given of the known geographical distribution of *Phlebotomus* in India [*R.A.E.*, B, xii, 113], including records of species described since the previous list [*loc. cit.*] and of *P. papatasii*, Scop., from Afghanistan and Persia and *P. squamipleuris*, Newst., from Iraq.

In the third paper notes are given on the papillae on the first segment of the antennae of *Phlebotomus* and various anatomical details of *P. squamipleuris*. The fact that the latter is attracted to light and is a garden species [*R.A.E.*, B, xiv, 148] is confirmed. The relation between the geographical distribution of *P. sergenti*, Parrot, of which *P. caucasicus*, Marz., is considered a synonym, and oriental sore is briefly reviewed. The fact that this sandfly has been recorded from 13 different places in Asia and that in only one of these oriental sore has not been found, makes the possibility of this species being a carrier of the disease, in Asia at least, worthy of further consideration. As regards North Africa, Sargent and his collaborators consider the vector to be *P. papatasii*, Scop., [*R.A.E.*, B, x, 39 ; xiv, 78, etc.], identifying the living sandflies studied as this species owing to the fact that they were unable to find *P. sergenti* among large numbers of male sandflies collected. In view of the great difficulty of distinguishing the females of *P. papatasii* and *P. sergenti* in the living state the author does not consider this to be conclusive proof that the former is the vector. The same remarks apply to Palestine [*R.A.E.*, B, xiii, 175], where *P. sergenti* has also been recorded.

Recent records of the geographical distribution of kala-azar and *P. argentipes*, Annan. & Brun., are reviewed.

ROY (D. N.). **The Physiology and Function of the Oesophageal Diverticula and of the Salivary Glands in Mosquitoes.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 995–1004, 1 fig., 9 refs. Calcutta, April 1927.

This study of the oesophageal diverticula and the salivary glands of *Anopheles stephensi*, List., and *A. subpictus*, Grassi, was undertaken with a view to ascertaining the cause of the wheal that follows a mosquito bite, some having attributed it to the irritation by the saliva, others to the contents of the diverticula. The experiments described show that either may be responsible.

COVELL (G.). **A New Species of** *Anopheles* **from Eastern India,** *A.* (*Myzomyia*) *ramsayi* ; **with a new Description of** *A.* (*Myzomyia*) *jamesii* **Theobald.**—*Ind. Jl. Med. Res.*, xiv, no. 4, pp. 1019–1025, 1 pl., 3 refs. Calcutta, April 1927.

Anopheles (*Myzomyia*) *ramsayi*, sp. n., is described from Assam and Bengal. This species had been confused in the literature with *A. jamesi*, Theo., which is here redescribed.

MEGAW (J. W. D.) & GUPTA (J. C.). **The Geographical Distribution of some of the Diseases of India.**—*Ind. Med. Gaz.*, lxii, no. 6, pp. 299–313, 13 maps. Calcutta, June 1927.

Particulars gathered from replies received from 240 Civil surgeons of the Provinces and States of India to a questionnaire are supplied in regard to the geographical distribution of some of the diseases of that country, including typhus and diseases resembling it such as tick-borne typhus, relapsing fever, kala-azar, sandfly fever, dengue, and filariasis.

GOYLE (A. N.). **On the Transmission of Plague by** *Xenopsylla astia* **and** *X. cheopis*. **Preliminary Observations.**—*Ind. Med. Gaz.*, lxii, no 6, pp. 317–318, 7 refs. Calcutta, June 1927.

Of the three species of *Xenopsylla* so far found on Indian rats *X. astia*, Roth., and *X. cheopis*, Roth., are the commonest, the third, *X. brasiliensis*, Baker, having a very limited distribution.

Evidence on the relation of the distribution of *X. cheopis* and *X. astia* to the incidence of plague is extremely conflicting. A series of transmission experiments made in Lucknow on rats from Madras and from Jhansi (United Provinces) showed varying results, although rats from Jhansi have previously proved as susceptible to plague as those from Madras. Both with *X. cheopis* and *X. astia* 3 out of 7 experiments proved successful with Madras rats (the vitality of which may have been lowered by the unaccustomed climate and transport), while in a series of 12 experiments with Jhansi rats, 9 were successful with *X. cheopis* and only 3 with *X. astia*, transmission being very much delayed in two out of these three. In further experiments male fleas of both species were found to transmit plague, while females failed to do so. In two experiments with guineapigs *X. cheopis* carried plague in both whereas *X. astia* did so in one only.

FREUND (L.). **Läusestudie vi. Menschen- und Affenläuse.** [Louse Study vi. Human and Simian Lice.]—*Prager Arch. Tiermed. u. vergleich. Path.*, vi, Teil A (Sonder-Heft), no. 1, pp. 113–122, 4 figs., 16 refs. Prague, 10th May 1926.

The author records a number of species of *Pediculus* that have been described from *Ateles* spp. in America or from anthropoid apes. Nuttall has expressed the view that several of these are not distinct from *P. capitis*. If the lice hitherto found on monkeys are human lice the question arises as to how they reach the monkeys and maintain themselves on these hosts. The views of various investigators are here briefly surveyed. Larvae, males and females of lice collected from a specimen

of *Ateles ater* that died in the Zoological Gardens, Leipzig, proved to agree in every way with *Pediculus capitis* except that in the male sex there was a slight difference in the genitalia that may permit its differentiation as form *atelis*, n.

Freund (L.). **Läusestudie vii. Die männliche Genitalregion der Anopluren.** [Louse Study vii. The Male Genitalia of Anoplura.] —*Prager Arch. Tiermed. u. vergleich. Path.*, vii, Teil A, no. 1, pp. 40–52, 11 figs. Prague, 27th May 1927.

The contents of this paper are indicated by its title.

Ewing (H. E.). U.S. Bur. Ent. **Descriptions of three new Species of Sucking Lice, together with a Key to some related Species of the Genus** *Polyplax*.—*Proc. Ent. Soc. Wash.*, xxix, no. 5, pp. 118–121. Washington, D.C., May 1927.

The new species are : *Polyplax alaskensis*, from a single male taken on a mouse (*Microtus* sp.) in Alaska ; *Linognathus panamensis*, from females taken on a deer (*Odocoileus chiriquensis*) in Panama ; and *Phthirus gorillae*, described from nymphs taken with eggs on *Gorilla beringeri* in the eastern Belgian Congo. A key is given to the group of four species allied to *Polyplax spinulosa*, Burm., including *P. alaskensis*.

Ewing (H. E.). U.S. Bur. Ent. **The Hippoboscid Fly,** *Ornithomyia avicularia* **Linnaeus, as a Carrier of Mallophaga.**—*Ann. Ent. Soc. Amer.*, xx, no. 2, pp. 245–250, 1 fig., 6 refs. Columbus, Ohio, June 1927.

A tabular summary is given of nine cases in which the bird-fly, *Ornithomyia avicularia*, L., has been observed as a carrier of Mallophaga. These include two new records from Ohio discussed in this paper ; the louse in each case was *Degeeriella interposita*, Kellog.

It is surprising that nearly all the records of bird lice attaching themselves to Hippoboscids have to do with a single species, *O. avicularia*, suggesting that there must be something in the habits or nature of the fly that causes the lice to attach themselves. Some possible reasons are suggested.

Walton (C. L.) & Wright (W. R.). **Agricultural Parasitology : An Introduction.**—Cr. 8vo, x+122 pp., 5 pls., 16 figs., numerous refs. London, Sidgwick & Jackson Ltd., 1927. Price, cloth 6s. net.

This practical handbook contains a short account of the parasites affecting farm animals and poultry in Britain and includes chapters on protozoa, worms and Arthropods, the last named occupying half the book. The matter is taken largely from lectures given by the senior author, and gathers in a concise form information that has hitherto been scattered over a considerable range of specialist literature. Notes are given on the collection and preservation of parasites, and the principles of zoological nomenclature are briefly explained in an appendix.

Szidat (L.). **Der Ueberträger der Trematodenkrankheit unserer Legehühner. Vorläufige Mitteilung.** [The Transmitter of the Trematode Disease of our laying Hens. Preliminary Communication.]—*Centralbl. Bakt., Paras. u. Infekt.*, Ite Abt. Orig., xcix, no. 7–8, pp. 561–564, 6 figs. Jena, 20th September 1926.

The Trematode disease of the oviduct in hens that occurs in part of East Prussia is due to *Prosthogoninus intercalandus*, Szidat. This fluke has been found in hens suffering from the disease and in previously healthy hens that were fed on *Libellula quadrimaculata*, L. The cysts have also been found in other Libellulids, *Gomphus* spp. The peasants on the peninsula have always shut up their poultry when flights of these Odonata occur. [*Cf. R.A.E.*, B, xv, 62.]

Szidat (L.). **Die Trematodenkrankheit unserer Legehühner, ihr Erreger und ihre Verhütung.** [The Trematode Disease of our laying Hens, its causal Agent and its Prevention.]—*Arch. Geflügelkunde*, i, no. 5, reprint 9 pp., 5 figs., 6 refs. Berlin [1927?].

The Trematode disease of hens in Germany [see preceding abstract] is described. The principal Trematode concerned is *Prosthogoninus pellucidus*, v. Linstow; other species being *P. longus morbificans*, Seifried, and *P. intercalandus*, Szidat, which the author now considers to be probably an immature form of *P. pellucidus*. This is probably the case also with *P. japonicus* mentioned by Braun from Japan.

In nature the hens only appear to be able to catch the dragonflies harbouring the cysts in the early morning, when they are sluggish, or when they have been brought down by rain. It is not known how the dragonflies acquire the infection, but it is thought probable that they obtain it in the larval stage from molluscs. It is suggested that if wire-netting of a sufficiently small mesh be used to cover poultry runs, the Libellulid carriers of the Trematodes, which in East Prussia are usually *Libellula quadrimaculata*, L., will be unable to infect the birds. It is suggested that the real host of the Trematode is a wild bird, *Numenius arquatus*, common in marshlands, and that it is responsible for the mass-infection of the Libellulids.

Little (A.). **Poultry Parasites.**—*Rhodesia Agric. Jl.*, xxiv, no. 4, pp. 438–446, 1 pl. Salisbury, Rhodesia, April 1927.

This is a general account of parasites attacking poultry in Rhodesia, with recommendations for their control. External parasites include the fowl tick, *Argas persicus*, Oken; the red mite, *Dermanyssus gallinae*, DeG.; the leg scabies mite, *Cnemidocoptes* (*Sarcoptes*) *mutans*, Robin, which attacks the comb and neck in addition to causing scaly leg; the depluming mite, *C.* (*S.*) *laevis* var. *gallinae*, Raill.; the head louse, *Lipeurus heterographus*, Nitz.; the body louse, *Eomenacanthus stramineus*, Nitz. (*Menopon biseriatum*, Piag.); the shaft louse [*Menopon gallinae*, L.]; the wing louse [*Lipeurus caponis*, L.]; the fluff louse [*Goniocotes gallinae*, Retz.]; the large hen louse [*G. gigas*, Tasch.]; and fleas, of which the sand flea [*Echidnophaga gallinacea*, Westw.] is the most important, being the most prevalent of the external parasites in the Colony.

Sodium Fluosilicate for Poultry Lice.—*Qtrly. Bull. State Pl. Bd. Mississippi*, vii, no. 1, p. 20. A. & M. College, Miss., April 1927. [Recd. August 1927.]

Sodium fluosilicate has been tried as a remedy for poultry lice with such success in Mississippi that it will probably supplant both sodium fluoride and mercurial ointment. At least 100 birds can be treated with 1 lb., and it is both cheaper and more toxic to the parasites than other substances.

Yoshikawa (M.). **On the Larvae of *Cephenomyia trompe*, Modeer, parasitic in the Pharyngeal Cavity of the Reindeer in Sakhalin.** [*In Japanese.*]—Dobuts. Zasshi [*Zool. Mag.*], xxxviii, no. 460, pp. 82–87, 2 pls. Tokyo, February 1927. (With a Summary in English.)

The larvae of the Oestrid, *Cephenomyia trompe*, Mod., are found in the pharyngeal cavity of reindeer in Sakhalin and Japan, and are very injurious. The larvae of *Oedemagena tarandi*, L., occur in the subcutaneous connective tissue.

Rosenholz (H. P.) & Gilbert (M. J.). **Weitere Untersuchungen über die Rolle der Wanzen in der Epidemiologie des Rückfallfiebers.** [Further Investigations on the Rôle of Bugs in the Epidemiology of Relapsing Fever.]—*Centralbl. Bakt., Paras. u. Infekt.*, Ite Abt. Orig., ciii, no. 6–8, pp. 348–353. Jena, 10th September 1927.

The investigations on the infection of bed-bugs [*Cimex lectularius*] with *Spirochaeta duttoni* and *S. recurrentis* (*obermeieri*) [*R.A.E.*, B, xv, 121] have been continued. To test the possibility of the hereditary transmission of the infection in the bugs, crushed eggs and larvae from infected parents were injected into mice, but the results were negative. In further experiments the infection was not transmitted to mice by the bites of infected bugs at 37° C. [98·6° F.], this temperature being chosen because the previous experiments at room-temperature had failed.

The effect of low temperatures on the spirochaetes in the body-cavity of the bug was studied by keeping the latter at from 5° C. [41° F.] to −20° C. [−4° F.]. The bugs were dead after 24 hours exposure to the minimum, but the spirochaetes had not lost their mobility. This indicates the possibility of a hibernation of the spirochaetes in bugs in summer residences [in Russia] left unoccupied in the winter. This is all the more possible as the spirochaetes retain their viability and virulence in bugs that have been fasting for two and a half months. The lymph from such bugs harbouring mobile spirochaetes caused infection in mice. In a study of the behaviour of various micro-organisms in the body-cavity of the bug it was found that *Spirochaeta morsus-muris* remains mobile after two days, while *S. pallida*, *S. cuniculi* and *S. icterogenes* die in a few hours. *Trypanosoma equiperdum* occurred even after eight days.

These experiments had all been made with laboratory strains of spirochaetes, but in the case of bugs infected with the blood from a human case of relapsing fever, the infection was conveyed to a case suffering from paralysis by injection of the haemolymph.

Nieschulz (O.). **Ueber die Lebensdauer der Tabaniden.** [On the Length of Life of Tabanids.]—*Centralbl. Bakt., Paras. u. Infekt.*, Ite Abt. Orig., ciii, no. 6–8, pp. 421–423. Jena, 10th September 1927.

Observations in Java showed that *Tabanus rubidus*, Wied., and *T. striatus*, F., may live for seventy days in captivity. If opportunities are given, they suck blood on an average rather oftener than every second day.

Nieschulz (O.). **Overbrengingsproeven met** *Haematopota cingulata* **(Wied.).** [Transmission Experiments with *H. cingulata*.]—*Ned.-Ind. Bladen Diergeneesk. en Dierenteelt*, xxxviii, no. 5. (Abstract in *Tijdschr. Diergeneesk.*, liv, no. 7, p. 350. Utrecht, 1st April 1927.)

Haematopota cingulata, Wied., occurs in Java chiefly in forest areas. Some positive results were obtained in experiments in the transmission of surra from horse to horse by this Tabanid and also by *H. pungens*, Dol., *Chrysops flaviventris*, Macq., and *Tabanus flavivittatus*, Sch. Stekh.

de Blieck (L.) & Baudet (E. A. R. F.). **Bestrijding der** *Hypoderma*. [Measures against *Hypoderma*.]—*Tijdschr. Diergeneesk.*, liv, no. 10, pp. 454–457, 2 refs. Utrecht, 15th May 1927.

Excellent results against *Hypoderma* on cattle have been obtained by rubbing paradichlorobenzene or derris powder into the warbles. Each is used at a strength of 10 per cent., the former mixed with vaseline and the latter with liquid paraffin.

Szilady (Z.). **New and Old World Horseflies.**—*Biol. hung.*, i, no. 7, 30 pp., 1 pl., 30 figs., 30 refs. Budapest, 30th December 1926.

New species of Oriental Tabanids described in this paper are *Siridorhina zernyi*, from Ceylon ; *S. körösicsomana*, *Haematopota birói*, *H. flavicornis*, and *H. tenasserimi*, from India ; *H. atrata*, from Canton ; *Silvius piceus* and *S. ceylonicus*, from Ceylon ; *Psylochrysops* (n.n. for *Neochrysops*, Szil. nec Walton) *unizona*, *Tabanus pictiventris*, and *T. infamis*, from Borneo ; *T. lóczyi*, from Java ; *T. invalidus*, from Singapore ; *T. széchenyianus*, *T. semirufus* and *T. rufimedius*, from Tonkin ; *T. lucifer*, and *T.* (*Therioplectes*) *altaianus*, from China ; *T.* (*T.*) *latus*, *T. indifferens*, *T. acallus*, *T. rubidoides* and *T.* (*Callotabanus*, subgen. n.) *tenasserimi*, from India : and *T.* (*C.*) *sagittipalpis*, *T. wallacei*, *T. decoratus*, *T. destructus*, *T. limbatus* and *Chasmiellea polyzona*. New species from the Celebes are *Lissimas moestus*, *Neobolbodimyia argentata* and *Tabanus xanti*. The following new names are proposed for species described by Schuurmans Stekhoven [*R.A.E.*, B, xiv, 118], the names of which are preoccupied : *Tabanus nigrinus* for *T. nigerrimus* ; *T. bipustulatus* for *T. bipunctatus* ; *T. fenestralis* for *T. fenestratus* ; *T. frondosus* for *T. latifrons* ; and *T. schurmansi* [*sic*] for *T. ruficornis*. Twelve emendations are also proposed for names given to new species by Schuurmans Stekhoven. Several new varieties are described, and redescriptions and new localities are given for a number of old species.

New American species described are *Lepidosclaga major*, *Tabanus flavifrons*, *T. cubanus*, *T. laevicallus*, *T.* (*Lophotabanus* subgen. n.) *bifloccus* and *T.* (*L.*) *dorsifloccus*, from Cuba; *T.* (*L.*) *druyvesteijni*, from Trinidad, Panama and Dutch Guiana; and *T. floridanus*, from Florida.

The genus *Scione* is revised, the new species described being *S. minuta* and *S. punctata*, from Colombia; *S. picta*, from Bolivia; *S. crassa*, from Peru; and *S. costaricana* and *S. aurea*, from Costa Rica.

[Baranov (N.).] **Баранов (Н.). Guide for the Identification of Simuliid Larvae.** [*In Serbian.*]—*Glasnik Cent. Hig. Zavoda*, ii (iii), no. 1–3, pp. 93–96, 2 figs. Belgrade, 1927. (With a Summary in German.)

A brief description is given of the larvae of Simuliids, including a key to the young stages and an illustrated one to the mature ones. The species dealt with are *Simulium* (*Wilhelmia*) *equinum*, L., *S. columbaczense*, Schönb., *S.* (*Odagmia*) *ornatum*, Mg., *S.* (*O.*) *ruficornis*, Bar., *S.* (*O.*) *monticola*, Friederichs, *S.* (*O.*) *kondici*, Bar., *S.* (*Nevermannia*) *latipes*, Mg., *S.* (*N.*) *aureum*, Fries, *S.* (*N.*) *serbicum*, Bar., and *S.* (*N.*) *angustitarsis*, Lund.

[Baranov (N.).] **Баранов (Е.). The Larval Development of some Simuliids.** [*In Serbian.*]—*Glasnik Cent. Hig. Zavoda*, ii (iii), no. 1–3, pp. 97–104, 4 charts. Belgrade, 1927. (With a Summary in German.)

The development of the larvae of Simuliids from the egg to the pupal stage is described, as a result of studies on individuals reared in the laboratory and an analysis of the morphology. The various larval instars of *Simulium* (*Odagmia*) *ornatum*, Mg., are described in detail, and its development in Serbia during the period 22nd April to 12th May 1926 is discussed. The other species dealt with are *S.* (*Nevermannia*) *angustitarsis*, Lund., *S.* (*N.*) *aureum*, Fries, and *S.* (*Wilhelmia*) *equinum*, L. All these species have six larval instars, with a total duration of 21 days.

Hase (A.). **Beobachtungen über das Verhalten, den Herzschlag sowie den Stech- und Saugakt der Pferdelausfliege *Hippobosca equina* L. (Dipt. Pupipara).** [Observations on the Behaviour, Heartbeat and the Biting and Sucking Action of *H. equina*.]—*Zeitschr. Morph. u. Oekol. Tiere*, viii, no. 1–2, pp. 187–240, 15 figs., 3 pp. refs. Berlin, 1927.

These observations were carried out in the autumn of 1925 in southern and central Spain. At Seville *Hippobosca equina*, L., occurs throughout the year. The technique employed in capturing and keeping the flies is described. The best results were obtained by leaving them in the muslin bags in which they were caught, as they move readily about among the folds of material when the bags are laid out flat, whereas in glass cages they very soon damage their wings by beating against the sides. For feeding experiments it was found best to remove a fly with a pipette and place it on the skin; as soon as it becomes attached, the pipette is removed. As many as 50–70 flies were kept in one bag. They will live for 6 days without food.

The adults of *H. equina* have been noticed flying in the sunshine over domestic animals prior to pairing, of which at least the last stages occur on the skin of the host. The usual hosts are the large domestic mammals, but man is also attacked. Up to the present 13 different hosts have been recorded, including 2 birds.

The structure of the mouth-parts is described and illustrated. The act of biting and feeding has been studied in detail, and is probably similar in many other pupipara. Having found a suitable spot on the skin for feeding, the fly may make one or two preliminary punctures until the haustellum comes in contact with a suitable blood-vessel under the skin, after which it immediately begins to suck. The abdomen gradually expands with the ingested blood, and excretion occurs during feeding, so that some of the freshly ingested blood is immediately evacuated.

The duration of feeding varies from about 7 to 24 minutes. In one case, however, a fly fed uninterruptedly for 43 minutes; even in this case, which was on the forearm of a man, no reaction was observed on the skin. During feeding the flies are practically unaffected by external influences, such as movement of the skin, actual contact, light, or even removal of the legs.

Dikmans (G.). **Report of the Parasitologist.**—*Rept. Porto Rico Agric. Expt. Sta. 1925*, pp. 22–24. Washington, D.C., April 1927. [Recd. August 1927.]

Lyperosia (*Haematobia*) *irritans*, L. (horn fly) was taken on animals in the dry section of Porto Rico, and larvae of *Hypoderma* sp. were found on imported cattle.

Yearbook of Agriculture 1926.—8vo, xxi + 1298 pp., 270 figs. Washington, D.C., U.S. Dept. Agric., 1927.

In his report the Secretary of Agriculture, W. M. Jardine, states that the loss due to cattle grub [*Hypoderma*] in the United States has been estimated at about £10,000,000–£20,000,000 annually. Dairymen estimate that a reduction of 10–25 per cent. in milk yield is often due to irritation by these grubs. The growth of young stock is retarded, and their vitality is reduced. The only other veterinary paper of entomological interest is by W. M. MacKellar, who discusses the success of cattle tick eradication in the southern States and points out that the difficulty of ascertaining when all cattle on a range have been dipped has been overcome by placing a paint mark on each treated animal and subsequently making a check inspection, when all cattle not so marked are rounded up and dipped.

Schmit-Jensen (H. O.). **Eksperimentelle Undersøgelser over tovingende Insekters (Dipter's) Betydning som Smittespredere ved Mund- og Klovesyge.** [Experiments to determine the Part played by Diptera in the Transmission of Foot-and-Mouth Disease.]—*Maanedsskr. Dyrlaeger*, xxxix, no. 1, pp. 1–39, 3 figs., 25 refs. Copenhagen, 1st April 1927.

The following is the author's summary of this paper: The biting fly, *Stomoxys calcitrans*, L., is incapable of transmitting foot-and-mouth

disease from infected to healthy guineapigs, even under highly favourable experimental conditions.

S. calcitrans does not come into consideration as a means of transmission of foot-and-mouth disease virus, since the latter loses its infectivity in the intestine of the fly. When, after about 26 hours, the course of digestion is completed, the virus can no longer be detected in the fly's organism. No virus capable of carrying infection was excreted with the faeces.

KOHN (F. G.). **Das Rind als Nebenwirt der Hirschlausfliege (*Lipoptena cervi* L.).** [Cattle as secondary Host of *L. cervi*.]—*Lotos*, lxxii, no. 5, pp. 207–208, 8 refs. Prague, September 1924. [Recd. June 1927.]

Lipoptena cervi, L., is recorded from a cow near Karlsbad.

FABRE (H.) & BERNARD (M.). **Sur un nouveau foyer de trypanosomiase bovine observé à la Guadeloupe.**—*Bull. Soc. Path. exot.*, xix, no. 6, pp. 435–437, 3 refs. Paris, 1926.

FABRE (H.). **Trypanosomiase bovine à la Guadeloupe.**—*Jl. Sta. agron. Guadeloupe*, vi (1926), no. 2, pp. 71–72, 1 ref. Pointe-à-Pitre, Guadeloupe, 1927.

Trypanosomes, identified by F. Mesnil as *Trypanosoma vivax* (*cazalboui*), were discovered in the blood of cattle suffering from fever, anaemia, and muscular atrophy in Guadeloupe in 1926. The parasite was probably imported with cattle from Senegal not more than 40 years ago and took some time to become acclimatised. About 40 cattle have shown symptoms of the disease within a period of eighteen months, the disease occurring in the proximity of forests or marshes. The symptoms first appear in October or November and disappear at the end of the dry season in April or May. An undetermined blood-sucking fly, which attacks the animals in the areas where the disease occurs, is considered to be the probable vector, the reservoir of the virus being possibly small mammals. An attempt to inoculate a guineapig proved unsuccessful.

CUMPSTON (J. H. L.) & MCCALLUM (F.). **The History of Plague in Australia, 1900-1925.**—*Australia Dept. Health*, Serv. Pubn. no. 32, 238 pp., 12 figs., 9 pp. refs. Melbourne, 1926. [Recd. August 1927.]

The authors have collected in this paper all available information on plague in Australia from 1900 to 1925, and compiled it as a consecutive statement for the benefit of future students of the subject and for the preservation of some material that would otherwise be permanently lost. The distribution and frequency of the various species of fleas found on rats in various parts of Australia and at the ports are shown in tables.

Fielding (J. W.). **Australasian Ticks.**—*Australia Dept. Health*, Serv. Pubn. (Trop. Div.) no. 9, 114 pp., 1 pl., 36 figs., 13 pp. refs. Melbourne, 1926. [Recd. June 1927.]

This is a compilation of the descriptions of Australasian ticks, and includes in a concise form notes on the identification of species, a general life-history of ticks, a list of 44 known species with their hosts and distribution, and notes on the synonymy, with keys to the genera of Ixodids, and to the species of *Ixodes*, *Haemaphysalis*, *Amblyomma* and *Aponomma*. A list of the hosts is also given. The ticks that cause disease in animals, either in Australia or elsewhere, are *Ixodes holocyclus*, Neum. (which also causes paralysis in man), *Haemaphysalis bispinosa*, Neum., *H. leachi*, Aud., *Rhipicephalus sanguineus*, Latr., *R. bursa*, C. & F., *R. evertsi*, Neum., *Boophilus annulatus australis*, Fuller, and *Amblyomma* spp.

Guerrero (R. P.). **Necesidad de la Destrucción de las Garrapatas en la Zona del Litoral.** [The Need for Tick Destruction in the Coast Region of Ecuador.]—*Bol. Subdirecc. téc. Agropecuaria del Litoral*, ii, no. 3, multigraph pp. 1–16, 1 fig. Guayaquil, February-March 1927.

Ticks, among which *Boophilus* (*Margaropus*) spp. predominate, are serious pests of cattle in the coastal region of Ecuador. The method of changing pastures and thus starving the ticks is not advocated, partly owing to the lack of knowledge of their local biology. The use of an arsenical dip is advised, and a tank suitable for local conditions is described, with instructions for its use.

[Junkovski (E.).] **Цунковски (E.). Some Information on "Persian Relapsing Fever" ("Miana," the Disease of Miané).** [*In Serbian.*] —*Glasnik Cent. Hig. Zavoda*, ii (iii), no. 1–3, pp. 56–66, 8 figs., 5 refs. Belgrade, 1927. (With a Summary in French.)

The author does not agree with Brumpt (whose view was followed in abstracting papers by Samsonov and Latuishev [*R.A.E.*, B, xiv, 193 ; xv, 95]) that *Ornithodorus tholozani*, Lab. & Mégn., is identical with *O. lahorensis*, Neum., and considers that the former is the vector of relapsing fever in Persia, as shown by circumstantial evidence, which has since been confirmed by Latuishev's experiments.

As regards the causal agent, *Spirochaeta* (*Treponema*) *persica*, though it appears to be morphologically identical with the louse-borne *S.* (*T.*) *recurrentis* and is considered identical by Brumpt, the symptoms produced by the two spirochaetes, both of which occur in Persia, are different. Morphological resemblances are not considered as sufficient proof of identity, as forms of *S. persica* also closely resemble *S.* (*T.*) *venezuelense* and *S.* (*T.*) *duttoni*.

Cooley (R. A.). [**Report of the Secretary, 1923-1926.**]—*6th Bienn. Rept. Montana State Bd. Ent.*, pp. 5–19, 1 chart. Helena, Mont. [1927.]

This report summarises the history of the investigations into Rocky Mountain spotted fever in Montana, particularly since the United States Public Health Service assisted in the establishment of a Research

Station in 1921 [*R.A.E.*, B, xi, 184]. It has been found that the Rocky Mountain goat, which is rather abundant in the mountains, is a very important factor in keeping up the numbers of the wood tick [*Dermacentor venustus*, Banks], a large percentage of the ticks found on it and in the areas where it occurs being infective. The importance of *D. venustus* lies in the facts that it is the only means by which man is infected with Rocky Mountain spotted fever ; it causes tick paralysis in man (generally children) ; it is one of the vectors of tularaemia ; its bite frequently induces resistant ulcers ; it is the causal agent of tick paralysis in sheep, among which it frequently leads to heavy losses ; and it is a severe parasite of both domestic and wild animals, such as horses, cows, sheep, deer and mountain goats.

During 1923–1926 Rocky Mountain spotted fever has appeared in four previously unaffected counties in Montana, probably as a consequence of increasing population and advance of agriculture into new territories, and the presence of ticks and the occurrence of spotted fever will remain a serious obstacle to the development of Montana until an adequate solution to the problem is found. A chart shows the life-cycle of *D. venustus* and the supposed cycle of the virus.

The Chalcid, *Ixodiphagus caucurtei*, du Buysson, a specific parasite of ticks, was introduced into Massachusetts in 1926 to control a severe infestation of *D. variabilis*, Say (American dog tick) on an island just off the coast, and although the success of the experiment is not yet assured, the recovery of parasitised ticks in nature indicates that the attempt may be successful. In experiments in France Dr. Brumpt found that *D. venustus*, from Montana, was the only tick on which 100 per cent. parasitism was obtained. Parasitised ticks were obtained from Massachusetts and the work of breeding the parasites has been begun in Montana, but it is not yet known how the climate and other factors will affect the success of the undertaking. The parasites only infest the nymphal stage of the tick, and it is not known whether the life-histories of the tick and of the parasite are so timed as to enable the parasite to pass through the full year's cycle.

O'Donnell (F. J.). **Control Work : Rocky Mountain Spotted Fever. Control Districts, Bitter Root Valley, for the Period January 1, 1923 to December 31, 1926.**—*6th Bienn. Rept. Montana State Bd. Ent.*, pp. 41–48. Helena, Mont. [1927.]

Control work in connection with Rocky Mountain spotted fever is being carried on within a definite area in Montana, within the boundaries of which the extermination of rodents (particularly ground squirrels) on which the immature ticks [*Dermacentor venustus*, Banks] feed, is being attempted, and the dipping of horses and cattle in order to kill the adult ticks is being practised regularly. These are the best known methods of combating the disease, and during the few years in which they have been carried out there has been a marked reduction in tick abundance and a lessening of the danger of infection in man. Although this work, which is reported in detail, is not sufficient in itself to eradicate either the disease or the tick, it is of great value and the longer it is carried on the better the conditions it will produce. A series of experiments was undertaken with the object of finding a suitable tick repellent for stock. A number of substances with an oil basis were tried, but in most cases had entirely disappeared from the animals after 7–10 days.

PARKER (R. R.) & SPENCER (R. R.). **Distribution and Spread of Rocky Mountain Spotted Fever in Montana.**—*6th Bienn. Rept. Montana State Bd. Ent.*, pp. 19–28, 1 map. Helena, Mont. [1927.]

Prior to 1914 there were only three comparatively small areas in Montana in which Rocky Mountain spotted fever was known to be endemic. Since then infection has spread into 34 counties. The situation of the original endemic areas and of later outbreaks is shown on a chart, and a table records all cases in the State from 1914 to 1926, with the totals by years and counties. The mortality rate from the disease in eastern Montana has averaged about 15 per cent., but in 1926 it was 33⅓ per cent. The obvious explanation of the method of extension of infection is by infected wood ticks [*Dermacentor venustus*, Banks] being carried into new areas by their animal hosts, whether wild or domestic; were this the case, however, it would be difficult to understand why the spread of infection should not have occurred many years ago. There has never been any evidence to indicate that the introduction of a few infected ticks would result in establishing infection in a locality at any appreciable distance from the parent focus, and the authors are of opinion that it is only under the most unusual circumstances that this can occur. A proof of this lies in the fact that infection has never crossed from the west to the east side of the Bitter Root Valley, although infected ticks must repeatedly have been carried across on wild and domestic animals during the many years that infection has been present on the west side. The alternative theory seems to be that the virus has been present in the areas concerned for some years, but that conditions have only recently become favourable for human infection. This hypothesis is supported by the fact that it is now believed that *Haemaphysalis leporis-palustris*, Pack. (rabbit tick) is able to maintain the virus in nature even in the absence of *D. venustus*. *H. leporis-palustris* does not normally bite man, and hence, in an area where this tick is the sole transmitting agent, the virus of the disease could be present for years without evidence of its existence. Infection of man would only occur if *D. venustus* were introduced, and even then the danger would not be immediate, as the rabbit tick virus is weak and only rabbits are infested by this tick, so that this weak virus, after being acquired by *D. venustus*, would then have to be passed through a series of susceptible hosts, during which its virulence would probably be gradually built up until it finally reached the point of being infectious to man. This theory is admittedly hypothetical, but there is a good deal of evidence to support it.

SPENCER (R. R.) & PARKER (R. R.). **Prophylactic Vaccination against Rocky Mountain Spotted Fever.**—*6th Bienn. Rept. Montana State Bd. Ent.*, p. 29, 2 refs. Helena, Mont. [1927.]

The vaccine prepared from tissues of infected individuals of *Dermacentor venustus*, Banks (*andersoni*, Stiles) as a prophylaxis against Rocky Mountain spotted fever [*R.A.E.*, B, xiv, 4] was used with much success during the year 1926 for the prevention of human infection, both against the virulent Bitter Root Valley type and the mild southern Idaho type. The results suggest full protection against the latter type, and partial protection, with sufficient modification to ensure recovery, against the former.

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Parker (R. R.) & Spencer (R. R.). **Tularaemia and its Occurrence in Montana.**—*6th Bienn. Rept. Montana State Bd. Ent.*, pp. 30–41, 1 map. Helena, Mont. [1927.]

This paper summarises present knowledge with regard to tularaemia [*R.A.E.*, B, xii, 123; xiv, 183] and gives an account of the disease as occurring in Montana.

It is primarily a disease of wild rodents; a list of 10 natural rodent hosts in Montana is given, though it is probable that all Montana rodents are susceptible. Besides *Dermacentor venustus*, Banks (*andersoni*, Stiles) and *Haemaphysalis leporis-palustris*, Pack., there are probably other parasites involved in the transmission of the usual agent, *Bacterium tularense*. It has been shown experimentally [*R.A.E.*, B, ix, 188, 189; x, 97] that *Haemodipsus ventricosus*, Denny (biting rabbit louse) can transmit infection among rabbits, and *Polyplax serratus*, Burm. (mouse louse) among mice, and that *Chrysops discalis*, Will. (deer fly) can carry infection from jack rabbits to man, though it is not certain that it can convey it from rabbit to rabbit. Infection has also been experimentally transmitted between California ground squirrels (*Citellus beecheyi*) by *Ceratophyllus acutus*, Baker (squirrel flea), and it is quite possible that other species of biting lice and fleas infesting rodents are also concerned. Records show that man may contract infection in several ways, of which the most usual is by contamination of the hands or conjunctiva with the tissues or body fluids of infected rabbits or ticks, or with tick excreta. This form of infection is so common that it is known as "rabbit fever" among market-men who dress rabbits for sale. The handling of sheep's wool apparently may lead to similar infection, probably owing to infectious tick excrement in the wool. Other methods of infection are by the bite of an infected adult of *D. venustus*, or of *C. discalis* (mechanical transmission), or by the bite of an animal that is itself infected or that transmits infection mechanically by teeth or mouth infected by eating infected rodents. Only three cases of this last method of infection have been recorded. The disease in man appears in two forms, glandular and typhoidal, the clinical aspects of which are described. In rodents, the disease is nearly always fatal, death occurring a few days after infection. Tularaemia periodically appears in epidemic form among rabbits; sometimes these epidemics are local and sometimes they involve large areas. Natural infection seems to be widely disseminated in Montana, especially in the eastern part of the State, and during the season 1925–26, 55 cases of tularaemia in man were recorded, all but 2 being on the eastern side.

Picard (F.). **Sur la forme adulte du** *Leptus autumnalis*.—*Bull. Soc. zool. France*, lii, no. 3, pp. 189–193, 1 ref. Paris, 30th June 1927.

The author records that for several years larvae of the harvest mite known as *Leptus autumnalis*, Shaw, have been abundant in two small gardens in Dijon from July to September, while in April thousands of adults of *Allothrombium* (*Allothrombidium*) *fuliginosum*, Herm., have appeared on the same ground. He considers that, in view of the restricted area of the gardens in question and the absence of any possible host for the larvae other than man, this proves the identity of *L. autumnalis* with *A. fuliginosum*, which is the most abundant and

widely distributed Trombidiid in France, although it is possible that the larvae of other species may sometimes attack man [*cf. R.A.E.*, B, x, 119; xiii, 178].

FLINT (W. P.). **The Control of Household Insects.**—*Illinois Agric. Expt. Sta.*, Circ. 257, 28 pp., 15 figs. Urbana, Ill., April 1922, revised May 1926. [Recd. August 1927.]

This is a revision of an earlier circular [*R.A.E.*, B, xi, 65].

ROHWER (S. A.). U.S. Bur. Ent. **A Chalcid Parasite of Screw-worm Flies.**—*Jl. Wash. Acad. Sci.*, xvii, no. 15, p. 407. Baltimore, Md., 19th September 1927.

A Chalcid parasite of screw-worm flies [*Cochliomyia macellaria*, F.] in the United States, which was believed, several years ago, to be a new species, has been determined by A. B. Gahan as *Brachymeria fonscolombei*, Duf., a species that is fairly common in Europe.

WALTON (C. L.). **The Agricultural Zoology of North Wales.**—*Univ. Coll. N. Wales, Dept. Agric.*, 42 pp. Bangor, July 1927.

These notes on the pests occurring in North Wales include a number of insect pests of domestic animals all of which have already been noticed [*R.A.E.*, B, xii, 65] except *Haematopinus asini*, L., observed on horses, and *Simulium ornatum*, Mg., attacking horses and cows.

DROUIN (V. F.). **Prévention et traitement de l'hypodermose du boeuf.**—*Rev. gén. Méd. vét.*, xxxv, no. 412, pp. 184–195, 11 refs. Toulouse, 15th April 1926.

In view of a new campaign planned against *Hypoderma* infesting cattle in France, a brief account is given of previous attempts to combat this fly and of the author's own experiments. Stabling is not a feasible measure, but the provision of shelters in pastures should be of some value, as the fly dislikes shade. In some cases animals less than eighteen months old, which are those most attacked, might be kept in stables during the sunniest part of the day between 15th June and 15th September.

The larvae are best dealt with from February or March onwards, when they establish themselves in the backs of the cattle. The author briefly discusses various materials that have been recommended for killing the larvae. Of those with which he experimented, paradichlorobenzene, mixed with vaseline in the proportion of 1 part to 5, gave the best results. The mixture can be made without heating, but is more homogeneous if warmed slightly. The hair is clipped over the orifice of the warble and a small quantity of the preparation is applied with a spatula. The application is repeated twice at intervals of a few days. Sodium fluosilicate did not give such satisfactory results as paradichlorobenzene and is more costly. Substances that gave unsatisfactory results included pyrethrum powder, phenol, cresol, carbon bisulphide and carbon tetrachloride; in two cases the last two chemicals apparently had a slight ill effect on the health of the animals.

Bevan (Ll. E. W.). **African Coast Fever.**—*Rhodesia Agric. Jl.*, xxiv, no. 6, pp. 649–652. Salisbury, Rhodesia, June 1927.

Theileria parva, the causal agent of African coast fever, is transmitted by *Rhipicephalus appendiculatus*, Neum., and occasionally by *R. evertsi*, Neum., and other ticks of this genus; it appears in the peripheral blood of infected cattle for a few days in the final stage of the disease, and it is then ingested by the larvae or nymphs of the ticks, in which it undergoes sexual development. *T. parva* is not transmitted through the eggs of the tick to the next generation, and cattle can only be infected by adults or nymphs that acquired the infection in the previous instar. Larvae of *R. appendiculatus* generally engorge and drop off their hosts in 3 days, nymphs in 3–4 days, and adults in 4–8 days; consequently dipping at intervals of 3–5 days is necessary to exterminate the ticks, although weekly dipping will greatly diminish their numbers. A determined effort is to be made to eradicate African coast fever in Southern Rhodesia by 1929, but this will only be possible through the co-operation of all stock-owners.

Manson-Bahr (P. H.). **The Relation of Wild Animals to certain Diseases of Man.**—*Proc. R. Soc. Med.*, xix (Sect. Comp. Med.), pp. 31–43, 42 refs. London, 1926.

The author reviews present knowledge regarding wild mammals as hosts and reservoirs of certain diseases of man, including sleeping sickness, caused by *Trypanosoma gambiense* and *T. rhodesiense*, American trypanosomiasis caused by *T. cruzi*, kala-azar, Rocky Mountain spotted fever, plague and tularaemia, all of which are transmitted by Arthropods. He discusses briefly the possible origin of parasitic diseases and of the life-cycles of the causal organisms.

De (S. N.). *Phlebotomus argentipes*.—*Indian Med. Rec.*, xlvi, no. 6, p. 170, 2 figs. Calcutta, June 1926.

Attention is drawn to the probable importance of *Phlebotomus argentipes*, Ann. & Brun., as the carrier of kala-azar in India, and instructions are given for the control of this sandfly in and around houses.

Adler (S.) & Theodor (O.). **The Transmission of *Leishmania tropica* from artificially infected Sandflies to Man.**—*Ann. Trop. Med. & Parasit.*, xxi, no. 2, pp. 89–104, 3 pls., 2 figs., 4 refs. Liverpool, 22nd July 1927.

Further experiments in the transmission of *Leishmania tropica* to man from sandflies (*Phlebotomus papatasii*, Scop.) artificially infected by feeding on a lesion of oriental sore are recorded [*R.A.E.*, B, xiv, 167; xv, 54]. In Jerusalem, where the experiments were carried out, *P. papatasii* is the commonest sandfly; less than 1 per cent. are *P. perniciosus*, Newst., and *P. minutus*, Rond., is very rare. In view of the importance of identifying the species acting as carrier of the disease, a careful investigation was made, and the authors have differentiated the females of *P. papatasii* from those of *P. perniciosus* by peculiarities of the teeth in the pharynx, which they have found to be a constant character [*cf. R.A.E.*, B., xiv, 96]. Out of 28 attempts at transmission by inoculation of material from dissected sandflies,

6 gave positive results. In every case that was successful the organism had developed for eight days or more in *P. papatasii*. Nine experiments in which *L. tropica* had developed from 2 to 7 days only in *P. papatasii* all gave negative results during an observation period from 5 to 15 months. The histopathology of three lesions of experimental cutaneous leishmaniasis was found to resemble that of naturally occurring oriental sores.

During these observations it was found that a number of the eggs laid by the sandflies in the laboratory did not hatch, as they were apparently destroyed by a parasitic fungus. From 5 to 15 per cent. of the sandflies caught in Jericho in 1925 and 1926 were found infected with the fungus, which was particularly abundant in the neighbourhood of the ovaries. In infected insects as many as 30 per cent. of fully grown ova were found to be infected and other eggs were infected 12 hours after dissection. As the fungus is not present in the alimentary tract of the adult sandfly, it appears that infection takes place in the larval stage.

ADLER (S.) & THEODOR (O.). **The Behaviour of Cultures of *Leishmania* sp. in *Phlebotomus papatasii*.—*Ann. Trop. Med. & Parasit.*,** xxi, no. 2, pp. 111–130, 2 pls., 3 figs., 6 refs. Liverpool, 22nd July 1927.

A series of experiments have been carried out for the purpose of comparing the behaviour of cultures of *Leishmania tropica* in the sandfly (*Phlebotomus papatasii*, Scop.) with that of Leishman-Donovan bodies ingested by the insect from a lesion. A good deal of the information in this paper has been noticed from an earlier one [*R.A.E.*, B, xv, 54]. The method of preparing the emulsion of culture and an apparatus devised for feeding sandflies on the culture through a membrane of rabbit skin are explained. Observations showed that the course of development of *L. tropica* in culture was changed in the sandfly and moulded into the type assumed by it when ingested by the sandfly from an oriental sore. In the course of tests made with other strains of *Leishmania*, using *L. brasiliensis*, *L. infantum* (Paris strain) and *L. infantum* (London strain), it was found that these strains could only be distinguished from each other by using media made up with inactivated immune serum, so that evidently the differentiation of strains by serological methods is not as simple as it was thought to be. The London strain of *L. infantum* behaved very similarly to *L. brasiliensis* in *P. papatasii* [*loc. cit.*], but the strain was more difficult to establish. The results of infection of sandflies with *L. infantum* (Paris strain) were very different from those obtained with *L. brasiliensis* and *L. infantum* (London strain) and more nearly resembled the behaviour of *L. tropica*. The infection rate was, however, higher than that of *L. tropica*, but the flagellates required longer to ascend the cardia.

HIRST (L. F.). **Researches on the Parasitology of Plague. Part II.—*Ceylon Jl. Sci.*,** Sect. D, Med. Sci., i, pt. 5, pp. 277–455, 4 charts, 5 maps, 7 pp. refs. Colombo, 16th May 1927. [Recd. July 1927.]

In the first part of this paper [*R.A.E.*, B, xv, 91] the author gave entomological and experimental data concerning the transmission of

bubonic plague by fleas, while in the present part the subject is dealt with from the epidemiological aspect. The distribution of rat fleas in plague-infected and plague-free areas, and of fleas infesting plague-infected rodents other than rats, is discussed. Few localities have been traced where *Xenopsylla cheopis*, Roths., occurs in the entire absence of any history of outbreaks of bubonic plague.

The author states his parasitological theory as follows: The incidence of bubonic rat plague is primarily governed by the magnitude of the respective populations of plague-carrying flea species infesting the rats of any given district; the population of any species of rat flea in any given locality varies according to the rat population, the nesting conditions, the suitability of the climatic conditions for the breeding of the particular species, and the number of fleas introduced in all stages of development from elsewhere; the flea population requisite for the continuous propagation of the epizootic varies in magnitude according to the species of flea; the vector efficiency of each individual flea of each sex and of each species, and, therefore, the flea populations effective for transmission, varies according to the climatic conditions; and the degree of dependence of the human epidemic on the rat epizootic varies directly with the readiness of the species of rat fleas concerned to attack man, and indirectly with the intimacy of association between man and the flea-bearing rats. The term "nesting conditions" includes natural enemies of the flea larva and larval food-supply.

This theory is discussed, and the three most important agencies in the dispersal of rat fleas, namely, man, rats and insectivores, are briefly dealt with. The occurrence of plague in Europe, Australia and the Far East, British India and Burma, and Colombo, is discussed, and in the last case the method and results of a flea survey are given in detail.

The following are the author's general conclusions: Everywhere in the world so far as is known the seasonal prevalence of *X. cheopis* is related to the seasonal incidence of epidemic and epizootic bubonic plague. *X. cheopis* is the prime vector of bubonic plague between the domesticated species of rats and between these rats and man; other species of *Xenopsylla* and various species of *Ceratophyllus* may temporarily extend an epizootic initiated by *X. cheopis* into *cheopis*-free territory, or prolong its seasonal period when *X. cheopis* is absent. The endemicity and epidemicity of bubonic rat plague in Europe, Australia, America, Japan, the coast of the Bay of Bengal and the adjoining territories depends on the establishment of the foreign species of flea, *X. cheopis*, upon local rats; in the absence of this species, occasional sporadic outbreaks are all that need be feared. In its presence the intensity of a rat epizootic will be a function of the numbers of *X. cheopis* in each part of the region, provided that the temperature of the air lies between 68° F. and 78° F. and the drying power of the air is not greater than that represented by a vapour pressure deficiency of 0·3 inches of mercury. The distribution of *X. cheopis* on *Mus* (*Rattus*) *rattus* in a region newly invaded by this species may be most irregular, the highest degree of infestation being found near the premises where imported produce infested with *X. cheopis* is being stored. In such cases there will be a positive correlation between the prevalence of *X. cheopis* and *M. rattus* and human plague incidence in the various parts of the region, and the results of the flea survey will be found to be an effective guide to plague preventive measures.

The last three chapters comprise a summary of the epidemiologically significant facts already elicited, together with a brief general discussion of their bearing on the problems arising out of the spread of bubonic rat and human plague. The essential facts regarding the more important species of fleas are recapitulated under the name of each. The factors that seem to have a special influence in the potential or actual spread of bubonic plague in any particular locality are the species of flea infesting rats of the locality; species, habits, plague susceptibility and abundance of the local rodents; the climatic conditions prevailing in the locality; the nature of communications and commercial intercourse between non-infected and infected regions; and the degree of association between man and rodent in various types of human dwellings. The significant difference between the dispersal of such fleas as *X. cheopis* and *Ceratophyllus fasciatus*, Bosc., is that the former is able to develop apart from its hosts' nest, so that it is capable of being much more easily dispersed in material such as grain, the débris of which affords nourishment for the larvae. Thus grain not only serves as a means of transport for rats and fleas from place to place, but is the most suitable medium for the multiplication of the most efficient insect vector of plague, *X. cheopis*, and the principal carrier of both disease and flea, the grain-eating *M. rattus*. Since the eggs of *X. cheopis* take about 3 weeks to develop and the newly-bred fleas can survive unfed for about a fortnight under tropical conditions, it follows that ships entirely free from rats might import live fleas in produce landed after 5 weeks at sea. The effect of seasonal change of climate unfavourable to the reproduction of plague-carrying fleas may be neutralised to a large extent by the continuous importation of other fleas in infested produce. The author discusses in detail the value of flea surveys as a basis for plague preventive measures.

A reprint of the author's paper entitled "Preliminary Notes on the Ecto-parasites of the Rats of Colombo," published in 1913, is appended; a summary of this paper has already been noticed [*R.A.E.*, B, ii, 38].

This complete paper has now been issued in book form by the Colombo Municipal Department of Public Health.

[Nikanorov (S. M.) & Knyazevskiĭ (A. N.).] **Никаноров (С. М.) и Князевский (А. Н.). Jerboas—*Rhombomys opimus*, Licht.—Carriers of Plague in Turkestan and the Transcaspian Region.** [*In Russian.*] —*Rev. Microbiol. & Epidémiol.*, vi, no. 2, pp. 154–159, 3 figs., 2 refs. Saratov, 1927. (With a Summary in French, pp. 256–258.)

The appearance and habits of the jerboa, *Rhombomys opimus*, are briefly described. Animals caught in the field were found to be infected with plague, and an emulsion made from the spleen of an apparently healthy jerboa produced typical experimental plague in a guineapig, causing its death. It is evident from these observations that jerboas are probable reservoirs of plague [*cf. R.A.E.*, B, xv 124]. The following fleas were found on them or in their burrows *Ctenophthalmus dolichus*, Roths., *Ophthalmopsylla volgensis*, Wagn. & Ioff, *Rhadinopsylla cedestis*, Roths., and species allied to *Ceratophyllus laeviceps*, Wagn., *Xenopsylla conformis*, Wagn., *Coptopsylla lamellifer*, Wagn., and *Neopsylla setosa*, Wagn.

[Ignat'ev (A. K.).] **Игнатьев (А. К.). The Buzachin Plague Outbreak.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 2, pp. 160–163, 2 refs. Saratov, 1927. (With a Summary in English, pp. 258–259.)

This is a short account of the outbreak of plague on a peninsula on the east coast of the Caspian in 1926. The outbreak was preceded by an epizootic among jerboas (*Rhombomys opimus*), and hares (*Lepus timidus*), as well as sporadic occurrences of the disease in camels. The clinical aspects and treatment of the disease are discussed.

[Bozhenko (V. P.).] **Боженко (В. П.). Trypanosomes of *Citellus* spp.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 2, pp. 164–171, 1 fig., 9 refs. Saratov, 1927. (With a Summary in French, pp. 259–260.)

An account is given of *Trypanosoma spermophili* found in ground squirrels (*Citellus* spp.) collected on the Volga near Saratov. Under natural conditions it is probably transmitted by ectoparasites, fleas, lice and mites being abundant on these animals. The experimental transmission by means of fleas has been attempted, but sufficient observations have not yet been made. Flagellates found in the gut of fleas taken on infected animals may possibly be intermediate stages of the trypanosome.

[Vlasov (Ya. P.).] **Власов (Я. П.). On the Question of the Relation between Bats and Mosquitos.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 2, pp. 174–175, 1 ref. Saratov, 1927. (With a Summary in English, pp. 260–261.)

Bats have been suggested as useful natural enemies of mosquitos [*R.A.E.*, B, i, 176], but the author has found large numbers of larvae and pupae of mosquitos, including malaria carriers, at a distance of about 2,000 yards from a cave in Transcaspia, from which thousands of bats were seen to emerge in search of food after sunset. The mosquitos were very troublesome at night and of five people, camping near the cave for three weeks, three showed ringed forms of the malaria *Plasmodium* in their blood.

No adult mosquitos were found in the cave, but the relation between bats and mosquitos requires further investigation [*cf. R.A.E.*, B, xiv, 125, etc.].

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). Instructions for Collecting and Studying Fleas (Aphaniptera).** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, vi, no. 2, pp. 191–220, 11 figs., 37 refs. Saratov, 1927.

Instructions are given for collecting, preserving and dissecting fleas, and for breeding them under laboratory conditions. An annotated list is given of the Protozoa, worms and mites parasitic on them, and a key to the genera and notes on the distribution and hosts of some of the species in European and Asiatic Russia compiled by I. G. Ioff is included.

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). Instructions for Collecting Zoological Material. XV. Instructions for Collecting and Studying Fleas (Aphaniptera).** [*In Russian.*]—8vo, 40 pp., 9 figs., 37 refs. Leningrad, Zool. Mus. Acad. Sci. U.S.S.R., 1927. Price, 50 *k.*

The bulk of this paper is the same as the preceding one, but in place of the key and notes contributed by Ioff, a key is given to the Palaearctic genera compiled by Yu. N. Wagner.

[Magnitskiĭ (V. I.).] **Магнитский (В. И.) Outline of the anti-malarial Campaigns of 1922-1925 in Western Bokhara.** [*In Russian.*]—*C.R. Acad. Sci. U.R.S.S.*, 1927, A, no. 11, pp. 169–174. Leningrad, 1927.

During the civil war of 1917–1921 the irrigation system in Bokhara was neglected, and as a result great swamps were formed where mosquitos bred in enormous numbers, and 60–100 per cent. of the population were infected with malaria. From 1923 attention was turned to controlling mosquitos by drainage and oiling, and the results were everywhere highly satisfactory.

[Moskvin (A. I.).] **Москвин (А. И.). The Control of Mosquitos as a Basis for the anti-malarial Campaigns undertaken during the Years 1922-1925 in Central Bokhara.** [*In Russian.*]—*C.R. Acad. Sci. U.R.S.S.*, 1927, A, no. 11, pp. 175–178. Leningrad, 1927.

This is a supplementary report to the preceding paper, giving details of the organisation of the anti-mosquito campaign in further localities. The mosquitos involved were *Anopheles bifurcatus*, L., *A. maculipennis*, Mg. (*claviger*, auct.), *A. superpictus*, Grassi, *A. pulcherrimus*, Theo., and *A. hyrcanus*, Pall. *A. superpictus* was the most abundant, but malaria was most severe where all five species occurred. As a result of the measures taken the malaria incidence was reduced from 70–80 per cent. in 1923 to 0 per cent. in 1925.

Sliwensky (M.). **Die Malariafrage in Bulgarien.** [The Malaria Question in Bulgaria.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxxi, no. 9, pp. 414–428. Leipzig, September 1927.

Malaria is the most widespread disease in Bulgaria, and it occurs not only in the marshy lowlands, but at an altitude of over 3,000 ft. Information is given on its distribution and pathology, and on the measures taken against it both in the past and at present. The rice-fields, which are kept under water from April to September, are prolific breeding-places for Anopheline mosquitos. *Anopheles maculipennis*, Mg., and *A. sacharovi*, Favr (*elutus*, Edw.) are very widely distributed and are the chief vectors. In hilly districts they may be found up to about 4,600 ft. The position of villages in river valleys and other protected situations favours the Anophelines, which do not fly far. Malaria may, however, be rife in villages without breeding-places owing to the wind-importation of mosquitos; and cattle pasturing in marshlands are followed by swarms when they return to the villages at night.

The other vectors of malaria in Bulgaria are *A.* (*Myzorhynchus*) *hyrcanus* var. *pseudopictus*, Grassi, *A. superpictus*, Grassi, and *A. bifurcatus*, L. *A. hyrcanus* var. *pseudopictus* prefers the warmer marshes with algae, and is very widespread in the rice-fields. It is an open air species exclusively. *A. superpictus* is, with *A. maculipennis*, probably the most widely distributed malarial mosquito in Macedonia, Thrace and the Struma valley. The larvae live in water with a sandy bottom without algae and need only a depth of a few inches, so that they occur in mountain streams and small rivers. This species is much rarer in marshy districts. *A. bifurcatus* is very rare in Bulgaria ; it occurs in rice-fields.

The abundance of Anophelines during the malaria season depends on the amount of rain in summer, and on the temperature in spring. The second generation of *A. maculipennis* largely depends on the rains in June and July. As malaria usually reaches its maximum in August this generation must be involved. The great heat in August dries up many breeding-places and rarely permits the development of a third generation except in permanent waters. If a third generation is present, malaria reaches its maximum in September. The abundance of *A. superpictus* is favoured by moisture in summer, but floods in spring wash away the larvae. Measures against mosquitos have gradually been re-organised since the passing of a malaria law in 1919, the work including the destruction of the adults in winter, the oiling of breeding-places, the provision of mosquito nets, and drainage.

COMYN (K.). **Antimalaria Work at Moascar, Egypt, in 1925 and 1926, and the Results compared with the previous two Years.**— *Jl. R.A.M.C.*, xlix, no. 1, pp. 14–26, 1 plan, 2 refs. London, July 1927.

An outline is given of the history of malaria in the Suez Canal Zone, and of the available civil and military statistics of the disease.

Anti-malarial measures at Moascar, a military camp near Ismailia in the Canal Zone, which were started in 1923, consisted mainly of draining and oiling marsh lands within a radius of 2 miles of the camp, supervising cultivated, irrigated areas in its vicinity, and the usual anti-mosquito work in the camp itself. These measures combined with quinine prophylaxis reduced the cases from 9·2 per cent. in 1923 to 1·3 per cent. in 1926 among the men stationed in the camp.

The two factors affecting the development of mosquitos and consequently the incidence of malaria in Egypt are the rise of the Nile and the rise of temperature combined with humidity. Owing to the rising of the Nile the potential breeding areas are greatly increased from August to December, but of these months the climatic conditions are only favourable to mosquito reproduction from August to October inclusive. The country is thus far less exposed to malaria than it would be if the river began to rise in April.

Charts showing the seasonal incidence of malaria at Moascar indicate that primary cases rarely occur before July, while the disease dies out completely by the end of November. As the swamps from which Anophelines invade the camp exist all the year round, the mean temperature of the ground is probably the main factor in malaria incidence, a mean daily temperature of less than 69° F. being approximately that below which the reproduction of the mosquito stops. The only two Anophelines caught in 1925 and 1926 were *Anopheles pharoensis*,

Theo., which is by far the commoner, and *A. multicolor*, Camb., which occurred only in small numbers late in the year. These breed in the vicinity of Lake Timsah and the Suez Canal, showing a marked preference for clean water. The commonest Culicines found were *Culex pipiens*, L., and *Aëdes* (*Ochlerotatus*) *caspius*, Pall., which breed in dirty and even foul water.

Symes (C. B.). **The Mosquito Problem in Kenya.**—*Kenya Med. Jl.*, iii, no. 4, pp. 93–103. Nairobi, July 1926.

It is probable that 15–20 per cent. of the sickness in any body of native labourers in Kenya is due to malaria, so that the eradication of the disease is of great importance. The only method that is likely to be in any degree successful is the control of the mosquitos by which it is carried. *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, and *A. christyi*, Newst. & Cart., the first two of which have been proved to be carriers of malaria in other countries, appear to be the prevalent Anophelines on plantations. The curve of abundance of *A. gambiae*, as is usual, coincides with the rainfall. It is apparently the species most closely associated with native labourers. *A. funestus* breeds in clean, shady streams, and *A. gambiae* in dirty, stagnant water, always exposed to the sun.

In purely native reserves the extent of mosquito breeding varies with the habits of the community, extensive cultivation supplementing the natural breeding-places owing to the crude drainage and irrigation connected with it. *A. gambiae*, *A. christyi*, *A. funestus*, *A. pretoriensis*, Theo., and *A. maculipalpis*, Giles, occur in such cultivated areas where there are many valleys with slow running streams. Where the river valleys are fewer and wider apart, *A. gambiae* abounds, together with *A. funestus* and *A. mauritianus*, Grp. In one valley at the end of a dry spell in May 1925, *A. pharoensis*, Theo., was almost the only mosquito observed, while in April 1926, only *A. gambiae* occurred. The few observations made suggest that natives are most frequently bitten in their huts. Huts with fires are not attractive to female mosquitos seeking food, and it is in the huts set apart for the unmarried members of the community that the majority of the Anophelines are found, as no cooking goes on there.

The occurrence of Anophelines in towns is illustrated by reference to Nairobi, where twelve species have been recorded [*cf. R.A.E.*, B, xiv, 80]. In January and February 1926 the species found in greatest abundance were *A. gambiae*, which was much the most numerous, *A. funestus* and *A. maculipalpis*. From the beginning of March to the third week in April only 3 per cent. of the mosquitos captured in houses were Anophelines, but by the end of May Anophelines represented 98 per cent., of which 98·8 per cent. were *A. gambiae*, the breeding-places of which are most numerous. Suggested mosquito control measures for Nairobi, principally draining, are discussed in some detail.

MacGregor (M. E.). **Mosquito Surveys.**—Demy 8vo, 282 pp., 3 maps, 59 figs., 23 pp. refs. London, Baillière, Tindall & Cox, 1927. Price, 15*s.* net.

This is a handbook for anti-malarial and anti-mosquito field workers, issued by the Wellcome Bureau of Scientific Research. A large part

of the book is devoted to an account of the mosquitos of Mauritius and Rodriguez, the bionomics and stages of each species being described and keys to the genera, subgenera and species, both for adults and larvae, being given. This detailed account is preceded by a general account of the morphology and biology of mosquitos, serving as an introduction to their study. The last section of the book deals with laboratory and field technique with regard to mosquitos and their control.

Root (F. M.). **Note on the Mosquito Fauna of the Republic of Haiti.**—*Amer. Jl. Hyg.*, vii, no. 4, pp. 463–469, 4 figs., 2 refs. Baltimore, Md., July 1927.

This list of 31 species of mosquitos collected by W. A. Hoffman in Haiti includes *Limatus hoffmani*, sp. n. The Anophelines have already been noticed [*R.A.E.*, B, xv, 101].

Root (F. M.). **Studies on Brazilian Mosquitos. II.** *Chagasia fajardoi.—Amer. Jl. Hyg.*, vii, no. 4, pp. 470–480, 4 pls., 13 refs. Baltimore, Md., July 1927.

The author considers that the differences separating *Chagasia* from other Anophelines, which he enumerates for all stages, are sufficiently great to justify its retention as a genus [*cf. R.A.E.*, B, xiii, 109]. He considers that the species recorded and described by himself and by Bonne and Bonne-Wepster as *Anopheles* (*Chagasia*) *fajardoi*, Lutz [*R.A.E.*, B, xi, 206; xiv, 59, etc.] is a distinct species for which he proposes the name *A.* (*C.*) *bonneae*, sp. n. All stages of these two species are compared. *A. bonneae* is known only from the interior of Surinam, while *A. fajardoi* has only been reported from the south-central parts of Brazil.

Larvae and pupae of *A. fajardoi* were discovered in Minas Geraes, Brazil, among grass-stems fringing a narrow channel containing swiftly running water, but were absent in shallow pools and backwaters where other Anophelines were fairly numerous. This is the first Anopheline recorded as breeding in rapid currents in the New World, and its larvae and pupae differ morphologically from those of other species, being apparently specially adapted to their environment. *A. fajardoi* has been observed to bite later in the evening than other Anophelines of the region.

Barber (M. A.). **The Food of Anopheline Larvae—Food Organisms in pure Culture.**—*Pub. Health Repts.*, xlii, no. 22, pp. 1494–1510, 10 refs. Washington, D.C., 3rd June 1927.

Laboratory cultures of larvae of *Anopheles quadrimaculatus*, Say, and *A. crucians*, Wied., were made to elucidate some of the problems of Anopheline breeding in nature, particularly those relating to the effect of physical agents, of food, and of products of decomposition. While it is well known that a breeding-place may become too foul for the development of Anopheline larvae, their absence in certain permanent waters, apparently fresh and favourable to them, has not been clearly explained. It is possible in these cases, as in corresponding cases in the cultures taken, that the quality of the products of vegetable decomposition, though too small in quantity to be easily recognised, may exercise some influence. These substances, when they occur in

nature, may act directly on the mosquito larvae, or may simply deter the females in their search for suitable places for oviposition. As larvae were often observed to die when only a few were present in a relatively large amount of liquid, while in some cases they reached maturity in a test tube, it would appear that their excretory products, unless a somewhat transient and varying factor, could hardly have been of much influence [*cf. R.A.E.*, B, xi, 162].

The methods employed in testing the mosquito eggs for bacterial contamination and of rearing the larvae in various cultures are described in detail. Oxygen was apparently necessary for the hatching of the eggs. The hydrogen-ion concentration of the cultures was usually kept between pH 6·5 and pH 8·5, that being the range within which *A. quadrimaculatus* and *A. crucians* are known to thrive in nature, and within this range no measurable effect of hydrogen-ion concentration on the development of the larvae could be detected. Larvae hatched and survived for 25 days at room temperature in a broth of pH 4·4, but this medium was unfavourable to food organisms ; however, this and other tests showed that a concentration as low as pH 5 was not harmful to larvae so long as food-supply and other conditions were favourable. The conditions that gave the larger proportion of successes in pure cultures of Anopheline mosquitos were the presence of living food, the use of eggs or young larvae of sufficient initial vitality, and the absence of an excess of certain products of decomposition, the formation of which was promoted by higher temperatures. The living organisms tested included an infusorian, *Colpidium* sp., a green alga, possibly *Chlamydomonas* sp., and two bacteria of the genus *Spirillum*. The results of the experiments showed that algae alone, bacteria alone, or infusoria alone may constitute a sufficient food for Anopheline larvae, while dead organic matter, in cultures at least, is a far less suitable food. The use of an algicide such as copper sulphate would be effective in controlling mosquitos only to the degree to which it might reduce the supply of available food. Although the removal of decomposing algae, which afford a good pabulum for bacteria and infusoria, might act indirectly in diminishing larval food, so much food would still remain available to these other food organisms that it is doubtful whether entirely satisfactory results could be obtained even with an algicide wholly effective in killing all algae. The experiments demonstrate the adaptability of Anopheline larvae to various food organisms, which must be taken into account in devising measures for their control by means of a chemical attack on their food. The mechanical removal of débris from the water is effective in that it deprives the larvae at once of both food and shelter.

A few experiments were made with *Aëdes argenteus*, Poir. (*aegypti*, L.) and another Culicine, probably *Culex fatigans*, Wied. (*quinquefasciatus*, Say) ; adults of the former were obtained in one case from larvae fed on bacteria alone and in another from larvae fed on *Colpidium* alone ; the latter was brought to maturity in a culture of mixed bacteria.

Observations were made on the surface plankton of the water of breeding-places of *Anopheles* in rice-fields in Louisiana and Arkansas and in pools and streams in Mississippi. Apart from bacteria, which were universal, unicellular algae were predominant ; colourless protozoa, usually infusoria, were next in order, while diatoms, desmids, *Euglena*, rotifers and small crustacea were often abundant. These observations showed, therefore, that the organisms that were found suitable as food in the laboratory cultures were plentiful in nature.

Studies of the Malaria Problem in Porto Rico.—*Porto Rico Health Rev.*, ii, no. 8, pp. 25–32. February 1927. (Abstract in *Pub. Health Repts.*, xlii, no. 25, p. 1713. Washington, D.C., 24th June 1927.)

Malaria investigations were carried out in Porto Rico in 1924 and 1925, and it was found that larvae of *Anopheles grabhami*, Theo., were numerous in very few foci during the summer and autumn. These foci, which were in both fresh and salt water, seemed to occur near pastures. Early in November the breeding of *A. grabhami* began to extend in all directions, although it was only during the height of the breeding season that larvae appeared in water of higher salt content near the ocean. The gradual replacement of *A. albimanus*, Wied., by *A. grabhami* was complete in many of the ditches by January or February, and from March onwards the breeding of the latter again decreased.

A. vestitipennis, D. & K., also occurred [*R.A.E.*, B, xiv, 113], and all three species were frequently found in the same ditches. The association between *A. vestitipennis* and *A. grabhami* was especially marked; both species seemed to prefer cool shaded ditches with a heavy growth of aquatic grasses. The former is apparently the less hardy of the two, and other factors than the character of the water deposits probably influenced breeding.

Le Prince (J. A.). **Mosquito Control in Relation to Impounded Water Supply.**—*Jl. Amer. Water Works Assoc.*, xvii, no. 1, pp. 31–36. January 1927. (Abstract in *Pub. Health Repts.*, xlii, no. 25, pp. 1713–1714. Washington, D.C., 24th June 1927.)

Instances are given of malaria outbreaks following the construction of impounding reservoirs, with rules for preventing the breeding of *Anopheles* in them. When possible the water should be maintained two or more feet higher in the non-mosquito season than in the summer. The object of lowering the water is to strand the floatage along the shore line and thus leave any mosquito larvae present at a clean edge where they are unprotected from their enemies, and also to make the shore line unattractive to mosquitos. The surface of the water should also be kept free from floatage, and new aquatic plants should be removed as soon as they appear, since some of these multiply rapidly and are expensive to remove if well established. When brush, trees, etc., are cleared from the lake bed, care should be taken to clear the upper third of all lake inlets since these may become important breeding-places of Anophelines if they are protected from waves. As mosquito production is generally at its maximum during the first three years after the water is impounded, weekly inspection of the lake may then be necessary. The lake cannot be overstocked with mosquito-destroying fish, and it is therefore advisable to start hatcheries for these fish several years before water is impounded.

Missiroli (A.). **La prevenzione della malaria nel campo pratico.** [The Prevention of Malaria in Practice.]—*Riv. Malariologia*, vi, no. 3, pp. 501–572, 11 figs., 12 graphs. Rome, May–June 1927. (With Summaries in Italian, p. 705, French, p. 706, English, p. 707.) [Recd. September 1927.]

This report summarises the results obtained in Italy, Sicily and Sardinia in 1925 and 1926 under the auspices of the Italian Public

Health Service in collaboration with the International Health Division of the Rockefeller Foundation. The work in two localities (in Sardinia and Calabria) with Paris green as a larvicide described by Hackett [*R.A.E.*, B, xiv, 17] has proved completely successful, malaria having been practically eradicated. Drainage on a large scale is evidently the basis of a radical change in malarial areas, but owing to the cost and time required for it, anti-larval work with Paris green will be useful in keeping centres of population free from malaria and in permitting a gradual return of peasants to the land.

Other work done has included a study of reclamation work in the Ferrara district [B, xv, 182] and the dusting of a large marshy area by means of an aeroplane, this being the first attempt of the kind in Europe. As the speed and height of the machine dilute the mixture of road-dust and Paris green, a strength of equal parts of each was adopted. From a height of 60–90 ft. all the larvae over a width of 160 yards can be destroyed.

Theoretically, anti-larval work should precede the emergence of the first adults of *Anopheles maculipennis*, which occurs early in March in South Italy and Sicily and early in April in Central Italy. As, however, a large increase of adults occurs during the second half of April in South Italy and during the first days of May in Central Italy, the practical course seems to be to dust just before these dates. Furthermore, as larvae hatching after 15th September require about 25 days to produce adults and as the appearance of mosquitos in October is not usually accompanied by cases of malaria, the last application of Paris green can be made between 15th and 20th September. The data collected suggest that dusting should be done every 20 days up to the end of April, every 15 days in May, and every 10 days from June onwards.

The larvae of *A. maculipennis* were never found in wells except once in Sardinia. *A. bifurcatus* often occurs in wells. Six top-minnows (*Gambusia*) were found sufficient to keep a well free from larvae.

A. superpictus hibernates chiefly in the larval stage. Fourth-stage larvae were taken in South Italy early in February ; they had evidently hatched about 15th December. This mosquito is most abundant in August and September. It is domestic and one of the chief vectors of malaria in the hilly districts of Calabria. As regards Anophelines in Italy, it is believed that the occurrence of males in catches indicates that the breeding-place is within $\frac{5}{8}$ mile. In August–September 1925 a town in Calabria was invaded by *A. superpictus*, and as only females were taken it was assumed that the breeding-places were at a distance. Anti-larval work in suspected localities $4\frac{1}{2}$ miles away actually prevented such an invasion in 1926.

DE SOUZA PINTO (O.). [**Anti-malarial Work in Brazil.**]—*C.R. 1er Congr. internat. Paludisme*, Rome, 1926, p. 225. (Abstract in *Riv. Malariologia*, vi, no. 3, p. 592. Rome, May–June 1927.) [Recd. September 1927.]

Measures against Anophelines in Brazil, which consist of the capture of the adults in malarial houses and in drainage, oiling, and stocking with fish against the larvae, may be limited to the two species, *Anopheles argyritarsis*, R.–D., and *A. tarsimaculatus*, Goeldi, found by Boyd to be the vectors of malaria there [*R.A.E.*, B, xv, 23].

Carneiro (H.) & Almeida (E.). **O problema da malaria em Paracamby, estudio e solução.** [The Malaria Problem at Paracamby—Its Study and Solution.]—*Serviço Saneamento Rural Estado do Rio de Janeiro*, 87 pp., 9 figs., 4 maps, 11 graphs. 1925. (Abstract in *Riv. Malariologia*, vi, no. 3, p. 593. Rome, May–June 1927.) [Recd. September 1927.]

Anopheles argyritarsis, R.–D., is the predominant Anopheline in a small town about 40 miles from Rio de Janeiro. The measure advocated is drainage, and a project for this is given.

Brèthes (J.). **Notas sobre los Anophelinos argentinos.** [Notes on Argentine Anophelines.]—*Physis*, viii, no. 30, pp. 305–315, 3 figs. Buenos Aires, 30th November 1926. [Recd. September 1927.]

The Anophelines known to occur in Argentina are *Anopheles pseudopunctipennis*, Theo., which is the most abundant species in the North and the principal cause of malaria there; *A. albitarsis*, Arrib.; *A.* (*Cellia*) *tarsimaculatus* var. *rondoni*, Neiva & Pinto, here treated as a distinct species; *A.* (*C.*) *rooti*, Brèthes, and *A.* (*C.*) *evansi*, Brèthes [*R.A.E.*, B, xiv, 197]; and *A.* (*Arribalzagia*) *annulipalpis*, Arrib. The male genitalia of the last three species are described.

Twinn (C. R.). **Mosquito Control at Ottawa, Ontario.**—*57th Ann. Rept. Ent. Soc. Ontario, 1926*, pp. 12–17, 3 refs. Toronto, 1927.

The local breeding-places of mosquitos affecting the city of Ottawa are discussed [*cf. R.A.E.*, B, xiv, 126]. The control work of 1925 was directed solely against the mosquitos that developed in large numbers in snow and rain pools situated in several acres of scrubby woodland, in the vicinity of a village to the north and adjacent to Ottawa. A mixture of 70 per cent. heavy and 30 per cent. light petroleum fuel oils was used and the results were very satisfactory, practically all the larvae and pupae being killed. The work in 1926 was begun on 15th May and finished on 27th May and was completely successful. The addition of one ounce of 50 per cent. solution of caustic soda in water to each gallon of oil reduced the surface tension of the oil, causing it to spread rapidly and evenly when sprayed on the water. The oil film remained for at least 7 days in spite of heavy rains and completely destroyed all stages of mosquitos present. The need for including the flood-water breeding areas to the north of the city, in any comprehensive control work, was demonstrated. The predominant mosquito in these areas is *Aëdes hirsuteron*, Theo. [*loc. cit*]. Many of the breeding areas near Ottawa could be permanently removed by adequate drainage.

Laboratory experiments were carried out with derris against mosquito larvae. When it was dusted on the water at a rate equivalent to about 3 lb. to the acre, the larvae died within a period varying from three-quarters to over 7 hours. Pupae died more slowly; in some cases 24 hours elapsed before death occurred. In field tests at Montreal against *A. vexans*, Mg., a mixture of 1 part derris to 4 parts French chalk was dusted just before sunset on the surface of the water of a shallow pool with a grass-grown bottom, at the rate of 1½ lb. derris to the acre. A satisfactory film of dust was obtained over the entire surface. After 16 hours a considerable proportion of the larvae had

succumbed, and a second examination made 60 hours after treatment showed all the larvae to be dead and floating on the surface of the water.

KRÜGER (H.). **Einige variationsstatistische Erhebungen über die Beborstung der Larve von** *Aëdes meigenanus*. [Statistics of Variation in Chaetotaxy in the Larvae of *A. punctor* var. *meigenanus*.]—*Zool. Anz.*, lxxiii, no. 11–12, pp. 285–297, 6 figs., 1 ref. Leipzig, 5th October 1927.

The contents of this paper are indicated by its title.

MARTINI (E.). **Ueber einige Abnormitäten bei Culicidenlarven.** [Abnormality in Culicid Larvae.]—*Zool. Anz.*, lxxiii, no. 11–12, pp. 297–301, 3 figs. Leipzig, 5th October 1927.

Cases of abnormality in the hairs of mosquito larvae are discussed.

CAWSTON (F. G.). **Aspects of Dengue Fever Prevention.**—*Jl. Trop. Med. & Hyg.*, xxx, no. 13, pp. 171–172. London, 1st July 1927.

Inadequacy of surface drainage is thought to be one of the chief obstacles to the control of *Aëdes* (*Stegomyia*) [*argenteus*, Poir.] at Durban, where it is believed to be the carrier of dengue fever, an outbreak of which has recently occurred. The author recommends for the prevention of mosquito breeding the employment of heavier metal and more sloping construction for roof gutterings, which, as they are exposed to great heat and sudden changes of temperature, easily become choked, warped or broken and afford likely breeding-places. The escape pipe is more effectual if placed in the middle of the guttering rather than at the corners. Unnecessary gutterings should be removed. Trees should not be allowed to overhang the roof, as the fall of leaves tends to block the drain.

Other measures suggested are the changing of water in flower vases at intervals not exceeding two days, the substitution of pot plants for cut flowers in the house, and the removal of all broad-leaved plants from the proximity of dwellings. A recent outbreak of dengue at Durban showed the disease to be most prevalent in that part of the town unconnected with the sewerage system, where rubbish is disposed of in holes in the garden.

ROUBAUD (E.). **La fièvre jaune dans le monde et les méthodes modernes d'action contre ce fléau.**—*Mat. Etude Calamités*, iv, no. 13, pp. 50–74, 4 maps, 13 refs. Geneva, April–June 1927.

This historical review of yellow fever throughout the world includes some account of the measures taken to control the vector, *Aëdes argenteus*, Poir.

HOFFMANN (W. E.). **Biological Notes on** *Laccotrephes* **(Hemiptera, Nepidae).**—*Lingnaam Agric. Rev.*, iv, no. 1, pp. 77–93, 12 figs., 2 refs. Canton, March 1927.

The life-history and habits of *Laccotrephes kohlii*, Ferrari, are discussed. It is commonly found in pools, ponds, ditches and small streams, in the province of Kwangtung, usually in shallow water.

It occurs equally in very dirty and quite pure water, neither temperature nor degree of pollution apparently influencing its presence or absence. Its food consists of terrestrial and aquatic insects, tadpoles and small frogs, and would no doubt include small fish if available. Under laboratory conditions the earlier instars showed a preference for mosquito larvae and pupae, and the later ones for tadpoles. The adults do not show any food-preference, but readily feed on mosquito larvae and pupae.

This bug has been used with success in one instance for the control of mosquitos, having been introduced into places where it would not occur normally. Of the various Rhynchota tried in this connection, the best results were obtained with this Nepid and a Belostomatid, *Sphaerodema*.

DE BEAUREPAIRE ARAGAO (H.). **Evolution de l'***Haemoproteus columbae* **et du** *Trypanosoma hannai* **dans la** *Lynchia maura* **Bigot.**—*C.R. Soc. Biol.*, xcvii, no. 25, pp. 827–829, 3 figs. Paris, 26th August 1927.

In a study of the development of *Haemoproteus columbae* in *Lynchia maura*, Bigot, the author obtained results similar to those of Adie [*R.A.E.*, B, xii, 170]. Pigeons were successfully infected by the inoculation of an emulsion made from *Lynchia* (bred in the laboratory) 5 days after the infective feed.

In one case laboratory-bred flies, fed on a pigeon infected with *Haemoproteus*, showed a number of crithidial forms in the digestive tract. The pigeon was found to be harbouring *Trypanosoma hannai*, but, as usual, the parasites were scarce in the blood. Attempts to infect other pigeons, either by the bite of the infected flies or by inoculation of an emulsion made from the gut and containing flagellates, were not successful.

MUNIZ (J.). **Quelques formes intéressantes trouvées dans des cultures de** *Trypanosoma cruzi*.—*C.R. Soc. Biol.*, xcvii, no. 25, pp. 821–823, 7 figs. Paris, 26th August 1927.

Various forms of *Trypanosoma cruzi* in cultures, and their behaviour are described. The existence of sexual forms is suggested by the apparent occurrence of pairing.

CHAGAS (C.). **Quelques aspects évolutifs du** *Trypanosoma cruzi* **dans l'insecte transmetteur.**—*C.R. Soc. Biol.*, xcvii, no. 25, pp. 829–832, 3 figs. Paris, 26th August 1927.

Two forms of *Trypanosoma cruzi* found in the blood of vertebrates are described; they are considered to be two sexual forms and not transitionary forms as believed by other authors. In certain experiments on the infection of *Triatoma megista*, Burm., a form was found in these bugs that may be interpreted as the pairing between the two sexual forms. Thin forms were also found that are apparently the result of multiple division of the paired trypanosomes and represent the stage transmissible by the bite of the insect. These forms have not been found in the immature stages of the bug. The metacyclic forms would seem to be due to asexual multiplication in the insect host of the male forms of the blood.

Pinto (C.). *Spiniger domesticus*, **n. sp. Hémiptère suceur d'insectes (Famille des Reduviidae, sous-famille des Reduviinae).**—*C.R. Soc. Biol.*, xcvii, no. 25, pp. 833–834. Paris, 26th August 1927.

Spiniger domesticus, sp. n., is described from Brazil, where it was found in 1922 in huts feeding on cockroaches and other insects. Of the individuals captured, 20 per cent. contained crithidia, for which the name *Crithidia spinigeri* [described elsewhere, *R.A.E.*, B, xv, 195] is suggested. The flagellates occur in the digestive tract of the adults and nymphs. A dog was given intraperitoneal injections of the intestinal contents of this bug and 15 days later showed *Trypanosoma* of the type *equinum* in the peripheral blood. Not a single individual of *Triatoma* was found in places infested by *S. domesticus*.

Pinto (C.). *Otiodactylus signatus*, **nouveau genre et nouvelle espèce d'Hémiptère suceur d'insectes. (Famille des Reduviidae, sous-famille des Reduviinae.)**—*C.R. Soc. Biol.*, xcvii, no. 25, pp. 846–848. Paris, 26th August 1927.

Otiodactylus signatus, gen. et sp. n., is described from Brazil.

da Costa Lima (A.). **Nota sobre o** *Telenomus fariai*, **novo Scelionideo, parasito endophago dos ovos de** *Triatoma megista* **(Burm.).** [*T. fariai*, a new endophagous Scelionid Parasite of the Eggs of *T. megista*.]—*Sciencia medica*, v, no. 8, pp. 450–452, 2 figs. Rio de Janeiro, August 1927.

The Scelionid, *Telenomus fariai*, sp. n., is described from specimens parasitising the eggs of the Reduviid, *Triatoma megista*, Burm., in the laboratory in Brazil. An average of 8 parasites emerged from each egg.

Pinto (C.). **Classification de genres d'Hemiptères de la famille Triatomidae (Reduvidioidea).**—*Bol. biol.*, no. 8, pp. 103–114, 13 figs. S. Paulo, 18th August 1927.

The sub-family Triatominae [*R.A.E.*, B, xv, 47] and the genera belonging to it are described, and a key to the latter is given.

Pinto (C.). **De la présence d'un stigmate respiratoire sur les tarses du** *Cimex hemipterus*, *C. lectularius*, *Pediculus humanus*, *Haematopinus eurysternus* **et chez les larves de** *Triatoma megista*.—*Bol. biol.*, no. 8, pp. 115–128, 12 figs. S. Paulo, 18th August 1927.

The title of this paper indicates its contents.

Rodhain (J.). **Contribution à la faune des Oestridés du Congo belge.**—*Ann. Paras. hum. & comp.*, v, no. 3, pp. 193–213, 1 pl., 7 figs., 8 refs. Paris, 1st July 1927.

In the course of studying the Dipterous parasites of the elephant and rhinoceros in Africa, the author obtained a quantity of material including adults of the Oestrid genera, *Pharyngobolus*, *Neocuterebra*

and *Ruttenia*, which were previously unknown, and the larvae of which are parasitic on elephants. He describes the second stage larva and adult of *N. squamosa*, Grünb., the egg and adult of *R. loxodontis*, Rodh., and the adult of *P. africanus*, Brauer.

The genera *Strobiloestrus* and *Dermatoestrus* are discussed as a result of study of larvae of *D. erikssoni*, Poppius (of which the larva and adult are described, the latter not having been previously known) and larvae of *S. antilopinus*, Brauer, and *S. oreotragi*, Scheben, taken on various species of antelopes in Africa. These genera are found to have certain affinities with each other and with the genus *Hypoderma*. The author concludes from his investigations that *Hypoderma*, of which the larval stages only of *H. corinnae*, Crivelli, and *H. gazellae*, Gedoelst, have been taken in Africa, is quite distinct from the other genera under discussion, but that *Strobiloestrus* is undoubtedly a second-stage larva of *Dermatoestrus*, and that *S. antilopinus* represents the second stage of *D. erikssoni*. Brauer erected both these genera in the same paper in 1892, and as *Strobiloestrus* appears first, this genus must remain and *D. erikssoni* becomes a synonym of *S. antilopinus*. It is not yet possible to determine whether either *D. strepsicerontis*, Brauer, or *D. oreotragi*, Scheben, is identical with *S. oreotragi*.

VON SCHUCKMANN (—). **Die Fliegenplage und ihre Bekämpfung.** [The Fly Pest and its Control.]—36 pp., 11 figs., 1 pl. Berlin, Julius Springer, 1927.

This booklet, issued by the German Imperial Health Office, gives a popular account of the medical importance of flies. The species more commonly found in or near dwellings are illustrated in colour.

RENNIE (J.). **A Case of Intestinal Myiasis in a Breast-fed Infant.**—*Parasitology*, xix, no. 2, pp. 139–140, 6 refs. Cambridge, 26th August 1927.

A case is described in which the larvae of *Musca domestica*, L., were found in the faeces of a breast-fed infant. This instance shows that *M. domestica* may attempt to breed in human dwellings in February in the rigorous climate of the north of Scotland.

LUCAS (C. L. T.). **Two new Species of Amoeba found in Cockroaches : with Notes on the Cysts of** *Nyctotherus ovalis*, **Leidy.**—*Parasitology*, xix, no. 2, pp. 223–235, 2 pls., 3 figs., 23 refs. Cambridge, 26th August 1927.

The different stages of *Entamoeba thomsoni*, sp. n., and *Endolimax blattae*, sp. n., are described from the hindgut of *Blatta orientalis*, L., and *Periplaneta americana*, L. No amoebae had previously been reported from the latter species. Cysts of the ciliate, *Nyctotherus ovalis*, in different stages were often observed in the hindgut of *B. orientalis*, and since no full account of them has previously been recorded, they are also described.

INDEX OF AUTHORS.

A reference in heavy type indicates that a paper by the author has been abstracted.

(K3453) Wt P2/D45 1,500 4/28 H & Sp Gp 52

GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets, it signifies that the name is not the one adopted.

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

M.

N.

O.

P.

Q.

R.

S.

T.

U.

V.

W.

X.

Y.

Z.